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CACTUS AND SUCCULENT JOURNAL

Of the Cactus And Succulent Society Of America

Vol. XXIII MAY-JUNE, 1951 No. 3

FIG. 31. Dr. Louis E. Blanchard in his Canadian cactus garden.

CACTUS AND SUCCULENT JOURNAL

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CONVENTION BULLETIN

The Local Committee in Denver has secured for our Convention the newly completed Masonic Temple at 1440 Independence Street in Denver's Lakewood District. This building has numerous rooms, built in public address system, projector, screen and two acres of hard surfaced free parking. It's only one block off of Colfax Avenue, Denver's great east to west artery. It begins somewhere out in Kansas, runs by the Capitol Building and on over the mountains to Utah. The best motels are close at hand.

While the business meetings will be held in private by the duly selected two delegates from each affiliated society, all other sessions will be open to any one who is interested enought to walk in, sit down and be quiet. Three matters of business will be handled by the Convention as a whole. These are the election of King and Queen, selection of next place of meeting and the new convention committee. Affiliated Societies wishing to be our hosts in 1953 should have their invitations engrossed, campaign buttons ready and a keg of cider in their headquarters.

A treat by the Denver folks will be open house in the late afternoon of the eleventh at the Cactus Shack, the home of Opuntia Liz. I'm told there will be "substantial" refreshments. Judging from my experience at the same place at the hands of the same group last July, that word "substantial" really means something. The garden of the Cactus Shack has great beds filled with magnificent specimens of hardy cactus from Colorado and the neighboring states. Tucked away near the garage is Mr. Eckstein's ingeniously heated glass house filled with tender exotics. Vocal solos will be rendered by Chiquita Bonita Juanita Marquita Conchita, a full blooded Rocky Mountain Canary.

At the time of writing (late March) your Chairman is working on the program. Some good speakers and fine pictures are already lined up with more on the way. They have to be good to get on this program.

Spend a Tip Top Vacation with us in the Roof Garden of America. Remember the dates. Convention program July 10-12. Field trip July 13 and 14.

Meet me there.

HOWARD E. GATES, *Chairman.*

Just had news that the California Cactus Growers Association has contributed $25 as first prize for the hat contest at the Denver Convention. Hats are to be decorated with a cactus and succulent motif—women are to make them and the men are to wear them.

EDITOR'S NOTES

There are many worthwhile articles on how plants grow, their culture and propagation. We like to publish such papers in hopes that the same principles may be applied to our specialized interest in cacti and the other succulents. Interest in succulents is comparatively recent and we are just learning many of the principles that have been found practical with other flowering plants. Soon we will start a continued series on Plant Reproduction that should be of real value to every reader. The Morphology of Cacti by Dr. Franz Buxbaum of Austria (edited by Ed. Kurtz of Pasadena, California) has been well accepted and soon the second section on flowers will be available. For new members we wish to explain the installment printing of Curt Backeberg's listing which appears in the center of each issue: this is a summary of twenty years' work in collecting and studying cacti together with the new species, genera, varieties and combinations that have been attributed to the author. Three more installments will complete one of the most valuable reference sources yet published in this JOURNAL. The many contributors may force this JOURNAL back to a monthly again and it is to them that we are grateful for always having more material than we could publish even as a weekly.

NEW BOOK

Flowers of the Southwest Deserts by Natt N. Dodge. 116 pages with detail drawings on almost every page. The purpose of the book is to introduce the common desert flowers to newcomers to the Southwest and to give information about the plant's interesting habits and how they have been used by animals, native peoples, and by settlers. Many cacti, as well as Agaves, Yuccas, Nolinas, Dasylirions, and Ocotillo, common names, flowering data and scale drawings will intrigue you. A wonderful book of information, postpaid $1.10. Abbey Garden Press, 132 W. Union St., Pasadena 1, California.

NEW LISTS

Gates Cactus, Inc., Corona, California. Illustrated retail list with many long-wanted collector's items. Free.

Pirtle's Cactus Garden, Rt. 1, Edinburg, Texas. Wholesale list April, 1951. Free to dealers.

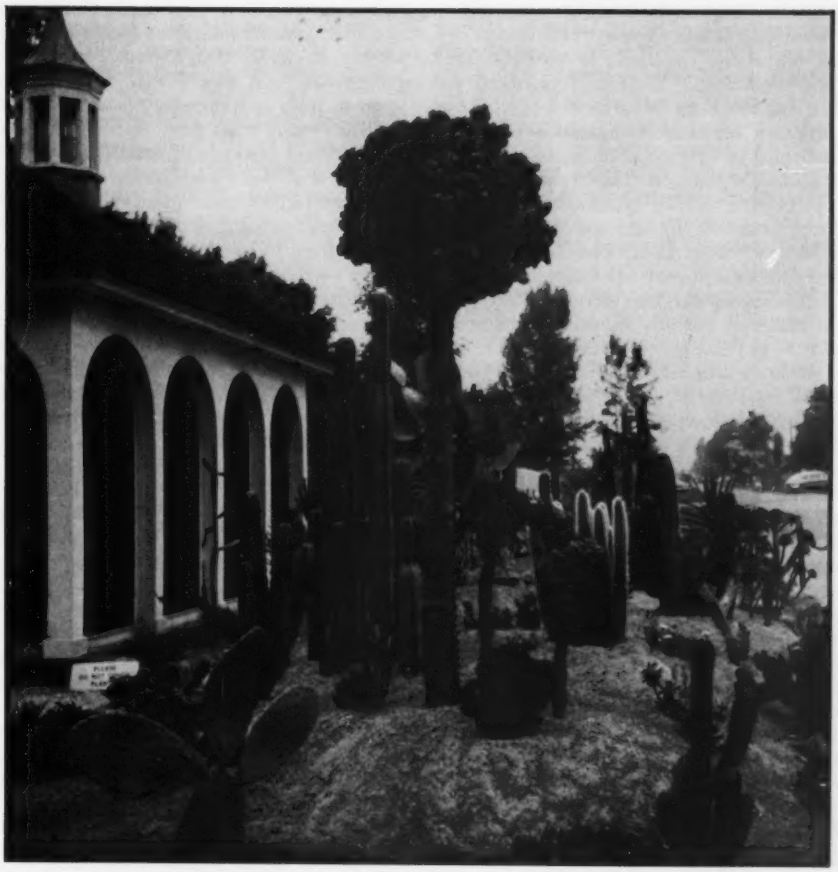

FIG. 32. The author's specimen plants are housed in a glasshouse in winter and arranged outside for the summer.

PLANT REACTIONS TO CHEMICAL AND PHYSICAL CHANGES

By DR. LOUIS E. BLANCHARD

(ONTARIO, CANADA)

[*Reprinted from* THE JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY, Vol. LXXV., Part 10. *October* 1950.]

In 1918 Kraus and Kraybill described the significance of the carbohydrate to nitrogen relation in Tomato plants. When the carbohydrate to nitrogen ratio is very high, the limited amount of nitrogen curtails the synthesis of protein. A high carbohydrate to nitrogen ratio, where ample nitrogen is available but carbohydrates in soluble and storage forms are in excess, results in abundant fruiting. A plant in low ratio, with abundant nitrogen and carbohydrates, but where photosynthesis cannot produce carbohydrates in excess for metabolism and storage, responds with an active vegetative growth. There is no reproductive response at this nutritional level. This principle applies to the majority of plant species, including cacti and other succulents, and is vital in a growing programme where quality production is the goal. Naturally, in a low carbohydrate to nitrogen ratio, where the supply of materials is insufficient for adequate assimilation, the plant is in distress because of starvation, and responds with frail vegetative growth.

In nature there is a balance between the root and shoot systems whereby the plant is kept in a nutritional balance conducive to maximum seed or fruit production. Quality is sacrificed for quantity inasmuch as the principal objective is reproduction. Small seeds or fruits in very large numbers offer a better chance for survival than a few specimen products. This is natural economy. The ratio of root and shoot systems essential for proper balance through the life-cycle of a plant will vary with its habitat. In the desert, Cacti and other xerophytes, because of the scarcity of food and water, may develop a huge root system strikingly out of proportion to its shoot. HASELTON (1) has recently described and illustrated such an unusual relationship. A Cactus (*Opuntia echinocarpa*), less than 2 feet tall and 1½ inches in diameter, developed primary roots over 35 feet long and this definitely only represented a small fraction of the secondary root system.

In cultivation, our objective is to produce plants and blooms of unusual quality and colour. In order to obtain a high but adequate carbohydrate to nitrogen ratio, we disturb the natural balance with its tendency to quantity production to one that is qualitative in character. This, in part, is accomplished by pruning the plant whereby photosynthetic production is reduced, without changing the nitrate absorption by the roots. Complete fertilizers or nitrates, according to needs, are also used in maintaining such a balance. The pruning must not be too severe, as it is desirable to have carbohydrate production sufficiently in excess to allow storage. In late summer, nitrogen should not be dominant in the culture of tuberous plants, as they must store food for the next generation. A chemical imbalance would produce inferior tubers. They should be grown until the tops are killed by frost so as to allow the maximum food accumulation.

In our greenhouses, our Chrysanthemum plants (and others) are pinched, pruned and disbudded to maintain these particular ratios. The blooms and colour of plants so treated are decidedly superior. This disturbance of natural growth has its limit of toleration. If the nitrate level is made very high in proportion to the carbohydrate content of the plant, it will respond with protein production for assimilation into protoplasm, as is evidenced by heavy top growth. Such an imbalance makes food storage impossible. I believe such a condition is frequently responsible for small inferior types of bloom or blind growth, depending on the degree of imbalance to the plant.

The life-cycle of blooming plants is so short that there is never complete recovery from any setback. In pricking off seedlings, even with the best technique, there is a shock of transplantation that takes its toll. Last August (1949) we planted stocks in two 75-foot benches in our greenhouses. In one bench, the seeds were sown in rows and later the plants were thinned out for proper separation. In the other bench, the seedlings pricked out from flats were planted. All seeds were sown on the same day. Soil and other factors were identical in both benches. The direct sowing showed superior growth, bloomed ten to fourteen days earlier, and with bloom spikes about twice the average length of those from the pricked out plants.

It appears that the root damage caused by transplanting, so interfered with absorption as to produce, among other things, a low nitrate to carbohydrate ratio. It probably required ten to fourteen days for the plants to recover from this traumatic shock and imbalance. This damage, however, was reflected in the quality of the blooms toward the end of the plant's life-cycle.

In a limited discussion, one cannot consider all the factors involved in a chemical balance in plants. For optimum growth, phosphorus, sulphur, calcium, magnesium, iron and potassium are essential in the plant's metabolism. The trace elements such as boron, silicon, copper, chlorine, zinc and manganese are also of vital importance. In their absence the signs of deficiencies are quick to appear. A soil that is chemically balanced for the average crop of plants, may show deficiency for special varieties. Stocks (*Mathiola incana*) are very sensitive to potash deficiency. Their lower leaves turn yellow and die, and later the upper leaves show the same pathology, starting at the tips and progressing toward the petioles. Accessory potash feeding, in addition to balanced fertilizers, are usually necessary to keep this type of plant healthy.

For the gardener it is helpful to remember a few of the basic associations between the elements and the plant functions; such as the dominant association of nitrogen with top growth; phosphorus with root growth; potassium with carbohydrate (sugar, starch) production. Plants growing in soils with high available phosphorus show vigorous root growth; whereas plants in a high nitrogen medium, develop roots definitely smaller than similar plants grown with balanced fertilizers. In drought, this abnormal root to shoot relation would present considerable hazard.

The early recognition of the signs of deficiency is extremely important. Prime production is impossible without perfect balance. Deficiencies due to trace elements, although very serious, require but a trivial absorption of their salts to correct the defect. When soil conditions make them unavailable, the soluble salts of iron, man-

ganese or other trace elements, in dilute aqueous solution sprayed on the foliage, will cure the malady. Although absorption by foliage is only slight, it is often adequate for trace element compounds.

In animal or plant life, serious diseases may be caused by the trifling absence of trace elements. In fertile Florida, cattle were starving in green pastures due to such trace element deficiencies as copper, iron and cobalt. Citrus malnutrition was solved by use of compounds of copper, zinc, manganese, magnesium and iron. The proper use of these compounds has brought progress and economic strength to large communities. Other quantitatively lesser substances as vitamins, enzymes, hormones and antibiotics are progressively assuming greater biochemical significance.

With the approach of autumn the soil nitrogen shows a decrease, and its ratio to carbohydrate is such that the plant stores food. This procedure is beneficial in the hardening process of perennials and also supplies energy for the spring growth. The application of a high nitrogenous fertilizer at this time would disturb a normal balance by stimulating vegetative growth which will easily be killed by frost, and by consuming the stored food that was reserved for spring growth.

A healthy plant would indicate proper nutrient ratio. A phosphorus deficiency would produce a poor root growth and, even if there were an abundance of nitrogen in the soil, the plant would still suffer from nitrogen deficiency because of its restricted absorptive mechanism. Ample nitrogen and phosphorus may produce vigorous vegetative and root growth but, if potash is deficient, the carbohydrate mechanism cannot properly function and the plant will soon be in distress. The biological functions are so itnerwoven and interdependent that any one deficiency may initiate a chain reaction of pathological events.

Even in the balanced presence of all material substances essential for plant life, adverse environmental factors such as cold or diminished light would be detrimental. Regardless how abundant the raw products may be, the plant cannot manufacture sufficient food with inadequate light. Water may be plentiful, but if the ground is cold, the absorption is slow. These are some of the reasons why, in northern greenhouses, winter-grown plants are decidedly smaller than the same species grown in the warm, sunny spring. Cold-grown snapdragons often wilt with the sudden appearance of bright sun. The air which is quickly warmed, promotes a transpiration more rapid than the absorption by the roots in the cold soil.

There are many factors involved in optimum growth. Unchecked rapid plant development provides maximum production in a minimum of time. Such procedures have been emphasized by DR. POST at Cornell. Large Geranium cuttings with all their leaves intact may be rooted and later potted with the production of large plants in a period of five to six weeks. The older methods required as many months. These procedures are not only botanically interesting, but also are economically important to commercial growers. With Chrysanthemums, short soft tip cuttings from vigorous stock plants are preferable. If sterilized sand is the rooting medium, several half-strength applications of a balanced liquid fertilizer should be applied. On soft green stems there will be no bud suppression when the plants are pinched. Cuttings should be taken from the sand or other rooting media when the roots are short (about ¼ inch). Planting at this time may be done with a minimum of root damage. Long-rooted cuttings with woody growth start the plants with a handicap from which there can be no complete recovery.

A rapid balanced growth indicates plant vigour; it is associated with optimum climatic and edaphic factors; it takes advantage of the natural growth cycles. A Fuchsia plant in the late fall may have fine foliage and blooms, but at this time is dormant as far as new vegetative growth is concerned. Cuttings at this stage will not root, but will do so as soon as the plant shows signs of new growth.

Under cultivation, in greenhouses and with house plants, there is a tendency for the soluble salts to approach toxic levels of concentration. Too liberal fertilizer applications and the use of the same soil for long periods aggravate this condition. As most of our common plants are mesophytes, they are intolerant of conditions approaching a xerophytic medium. As the osmotic tension of the soil-water increases, the plant's suction power becomes inadequate and wilting occurs, particularly so on sunny days. Under such conditions the plant's life is a precarious one; normal metabolism is impossible. Slight adjustments within physiological ranges probably take place, but for optimum growth this conditions must be corrected. The remedy, both for pot plants or bench growth crops, is copious leaching.

In nature, the mineral salts brought to the surface by evaporation are washed back in the soil by rain which is practically distilled water. Tap-water contains salts in solution, but the loss by percolation will be many times that which was added by leaching, and the soil can be restored to its proper tension level.

Soluble salts in soil solution ionize and are

good conductors of electricity. By use of the Solu-Bridge conductivity apparatus, the percentage of soluble salts in a soil extract can be accurately determined. The specific conductance or K value is read in terms of micromhos x 10^{-15} at 25° C. A specific conductance (K) of 100 approaches toxic levels of concentration and this corresponds approximately to 0.5 per cent of salts in solution. Tap-water in our greenhouses has an average K value of 25. K values of 75 and less are desirable for most crops. This phase of chemical imbalance, when recognized, can easily be corrected, and soils that are toxic because of this condition can be normally restored.

In our greenhouse experience, the most vigorous growth takes place when the soil-water is in its most available form, and this occurs when its tension is at zero or slightly above, as indicated by tensiometer readings. At these tensions wilting will not occur. Plants subjected to frequent wilting will not produce blooms of prime quality. At the wilting stage the stomata of the leaves are closed and the carbon dioxide intake essential in photosynthesis is practically cut off. Although the sun may shine on a plant in such condition, it cannot manufacture food. The plant's condition may be poor in a soil that is rich with products that are unavailable.

I have elsewhere (2) discussed the significance of soil reactions. The *p*H or soil reaction plays a predominant role. Most plants thrive in the *p*H range extending from about 5.6 to 6.5. The *p*H of 7 indicates a neutral reaction and readings above 7 show alkalinity. It is in the slightly acid range that the maximum solubility of salts takes place and thus become available. At higher and lower *p*H ranges, nutrient salts may become locked into insoluble compounds, or soluble toxic salts may be produced. Hydrangeas, Azaleas and Rhododendrons have need for considerable iron, and as iron salts are only soluble in an acid medium, a *p*H of about 4.5 is best suited for their needs. These acid-requiring plants are sensitive to iron deficiency and quickly show a chlorosis when this element is lacking. At low *pH* values toxic soluble aluminium salts may be present. The aluminium salts are only toxic to plants growing in the medium *p*H range. Plants in the lower acid scale have adapted themselves to this toxic salt and may possibly use it in their economy.

Soil reactions and temperatures may vary or intensify colours. Chrysanthemums blooming in the late summer are not as intense in colour as the same variety blooming in the late autumn. The high night summer temperatures accelerate the plants' respiration with considerable consumption of the sugars. The cooler nights of the autumn allow the storage of sugar which enters into the synthesis of the anthocyanin pigments which chemically are glucosides. High night temperature is an extravagance that most plants cannot afford and they soon become physiologically impoverished when grown in such a manner. In natural growth, the low temperatures are at night when the least amount of food is consumed in respiration, at a time when it cannot be manufactured.

The water-soluble plant pigments vary their colour with the plant sap reactions. Anthocyanins in acid medium become red; in an alkaline medium they are blue. Growing plants in the *p*H best suited for them will improve their colour. Hydrangeas require the presence of aluminium for blue coloration and the salts of this metal become available in the acid range. At a *p*H of 5.5 a clear blue will develop. With a scarcity or absence of soluble aluminium salts, the flowers are pink. White hydrangea blooms are indifferent to soil reactions, because the white in the petals, as it is in grey hair, is due to a colloidal dispersion of air bubbles in the tissues with its characteristic white light reflection. The response of foliage plants is more colourful when grown at the *p*H best suited for them. It is not my purpose to discuss here in detail the colours of vegetation but merely to point out that the contributing factors may be chemical and physical.

Spraying, dusting and the use of aerosols are not within the scope of this article. Their regular use is extremely important to the health of plants.

For the utmost in form and colour, time-pinching and disbudding are essential in the growth of pompon Chrysanthemums. Uncontrolled culture frequently results in a profusion of growth with few small blooms on many elongated slender branches. This is poor material for floral arrangements. Our objective in time-pinching is to allow only three main branches to grow, each to produce a full and symmetrical spray of choice blooms. The time of pinching is very important and will vary with the variety of the Chrysanthemum. Unless the date for the variety is correct, the harmony and beauty of the spray will be lost. If the pinching is done too early, the laterals on the main branches will grow too long before setting bud. This short-day plant cannot initiate bud formation until the proper photoperiod or day length has been reached.

A well-grown greenhouse Chrysanthemum plant should be eight or more inches tall when ready for pinching. Allow only three main stalks to develop and keep these well-trimmed. When the distal bud on each stalk is definitely set, it should be removed. If allowed to remain, this

bud produces a large bloom that is well past its peak at cutting time or is concealed by the lateral blooms later on. Disbud so that each of the three sprays will have about six blooms. When the plants are about 18 inches high, the leaves on the lower thirds should be removed. This provides better ventilation, more light, and facilitates watering and cultivating. These procedures place the plants in the high nitrogen to carbon ratio essential for select foliage and bloom production. So striking is the improvement over uncontrolled growth, that, at times, it is difficult to believe we are dealing with the same variety. Chrysanthemums are short-day plants; they can be forced into bloom earlier by shading with dark cloth during the long days, or their blooming period may be delayed by increasing the day length during short days, with electric lights. The combined use of these systems make it possible to grow Chrysanthemums the year round.

Plant behaviour under cultivation represents its responses to our treatments. These reactions are very flexible, but reach their maximum of quality in the absence of limiting factors.

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(1) HASELTON, S. E., "Desert Observations," *Cactus and Succulent Journal (of America)*, XXI:54-55, 1949.

(2) BLANCHARD, L. E., "The Significance of Soil Reactions," *Cactus and Succulent Journal (of America)*, XXII:57-60, 1950.

(3) YOCUM, L. E., "Plant Growth," The Jaques Cattell Press, 1945.

WITH THE COMMERCIAL MEN AND FLORISTS

Shipments of plants are usually received from the wholesale grower packed "bare root" which means they have been dug up, dried sufficiently to prevent sweating and rotting in transit and then packed between layers of paper and excelsior in cartons for shipment.

The most critical time in their future history is the period immediately after their receipt. If it is impossible to plant the plants at once, they should be un-packed, spread out in flats and placed in a shaded place until they can be cared for. Do not sprinkle or water them in any way.

Before planting, any broken roots should be cut off. Otherwise save all roots possible. The chief soil requirement is that any animal fertilizer in it should be well aged and that the soil itself be of a very porous nature. Drainage is very important. If at all possible steam sterilized soil should be used. Do not add any lime unless your soil or water is strongly on the acid side. After over twenty years spent in growing millions of cactus, we feel that most kinds prefer a neutral soil. We know that the building up of alkalies and other salts in the soil is harmful.

The plants should not be set deeper in the pots or flats than is necessary to hold them upright. Planting much deeper than the old ground line will greatly increase the danger of loss through rotting. After planting, the plants should be set in as light a place as possible, yet the glass should have enough shade to prevent sun burn. Most nursery grown cacti and succulents were grown with some degree of shade and the days of darkness while packaged enroute will add to their susceptibility to burning.

Once the plants have been set and given their place in the green house, comes their most ticklish time, for these plants must be handled differently from most anything else you grow. With most types of plants it is necessary to keep them constantly wet until they have established themselves. This kind of treatment will kill off a whole shipment of cactus and succulents in nothing flat. They should be watered sparingly and kept on the dry side until new root growth has started. This will usually be evidenced by new top growth. None of the cactus and succulents you receive will die for lack of water for weeks after receipt. However, they may stand still and not grow unless they get some. When these plants are established and growing, they require many times the water they will during this period. Plenty of heat will speed up new growth. Water less when the weather is dark and cold, more when it is clear and warm.

After plants have rooted, do not force them into rapid growth. Keep them growing slowly enough to produce a hard growth. Forcing heavily under shaded conditions that usually prevail in green houses, will produce soft, drawn out, worthless growth that may rot the minute it gets scratched or is watered too heavily. Usually the soft bodied plants will be much more susceptible to rot than the hard bodied ones. For example *Mammillaria bocasana* is notoriously weak in this respect while *Mammillaria hahniana* is very resistant. Haworthias are much harder than most Aloes.

Of course all this refers to nursery grown plants. Collected plants even though often very hard, should not have very much water at any time except after they are very well established and then only during their spring or summer growing period. Never cut off very heavy roots of collected plants unless they are broken. Rot will usually travel up the core of heavy roots that have been cut off, until it reaches the heart of the plant itself. HOWARD E. GATES.

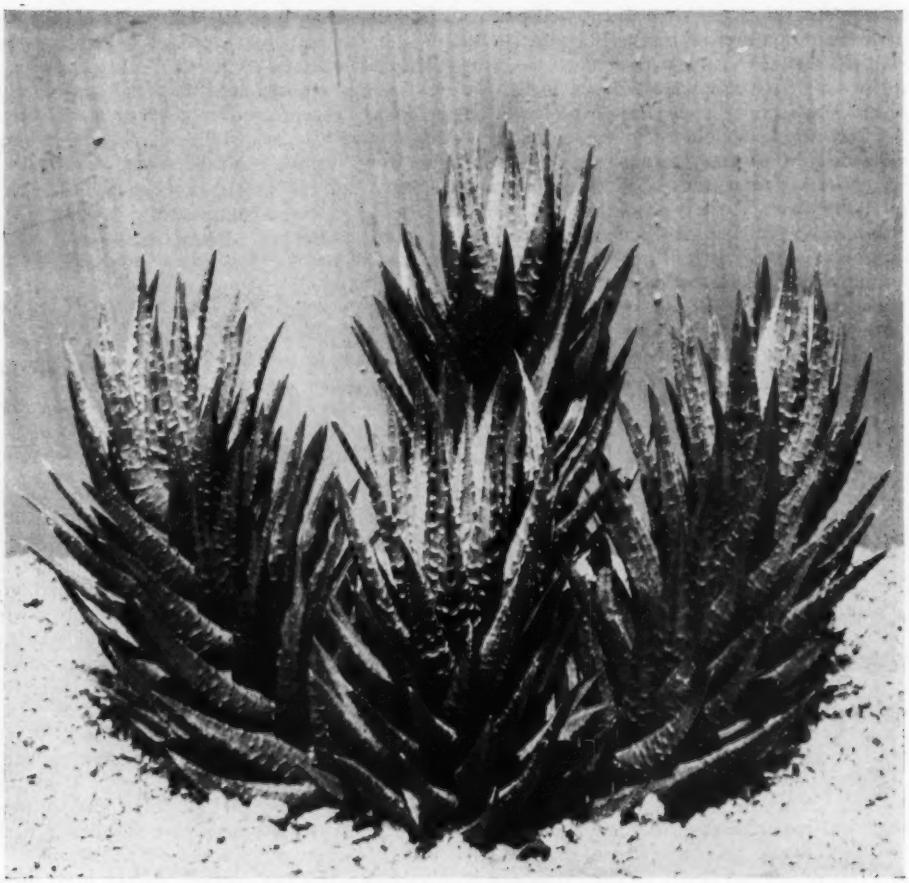


FIG. 33. *Haworthia Jacobseniana* Poelln. nat. size.

NOTES ON HAWORTHIAS

By J. R. BROWN

Haworthia Jacobseniana Poelln. in Desert Plt. Life IX (1937) 102 fig., in Repert. Sp. Nov. XLIII (1938) 109; Resende in Mem. Soc. Brot. 11 (1943) 88 fig. 2c.

Plant with leafy stems 10-12 cm. tall, proliferous from the base.

Leaves green, pruinose, especially the younger leaves, erect-spreading, more or less incurved in the upper part, 2-3 cm. long, 7-8 mm. broad towards the base, lanceolate, and terminating in a short, pellucid point; face flat or lightly convex in upper part, usually entirely smooth; back convex, strongly keeled, with about 7, including the keel, lengthwise tubercled lines; margins tubercled, becoming serrulate upwards and to entirely smooth at the tips; keels similar to the margins; tubercles concolorous or whitish-green, rounded or transversely oblong, often transversely confluent in lower part of leaf, sometimes in irregular transverse rows.

Dr. von Poellnitz compares this Haworthia, of the sect. *Coarctatae,* with *Haw. Jonesiae* in size, etc., however as is indicated by the photo of the plant he describes, it was evidently a small plant which did not quite show its mature character. It differs from *Haw. Jonesiae* Poelln. quite distinctly by its shorter stems, slightly longer and more spreading leaves and the tubercles on the back of the leaves. I was in some doubt of the identity of this plant, but I have also received a plant of this sp. from Dr. Resende of Lisbon which is identical.

Type locality: Cape Colony, Miller near Jansenville.

Named in honor of H. Jacobsen, curator of Kiel Botanic Garden, Germany.

FROM HERE AND THERE

Edited by SHERMAN E. BEAHM, 2686 Paloma, Pasadena, California

EPIPHYLLUM NOTES

The Research Department of the Epiphyllum Society of America has compiled a list of ten hybrid Epiphyllum hybrids which (though possibly not fool-proof) seem to fill a number of basic points for the novice collector. Points such as: easy to grow; easy to flower; inexpensive; procurable from most reputable dealers; in other words, best for the beginner. EDEN was chosen in the white to yellow group. PADRE and BOHEMIENNE in the pink. AGATHA and ARGUS, pink with darker centers. FLAMINGO a good orange, violet-edged throat. ACKERMANNI HYBRID and VIVE ROUGE two totally different reds. CONWAY GIANT in the very dark red and purple group. Finally PROF. EBERT a nearly one-toned fuchsia purple.

Mrs. Graves of New York started her collection from a tiny cactus purchased from a 5 and 10 cent store. Later, on a trip to the Desert Botanical Garden in Tempe, Arizona, she learned that they should bloom and this stimulated her hobby. Among her larger specimens is a Burrow's Tail (*Sedum Morganianum*) which covers a small stand and is spectacular with its many white flowers.

Mrs. George B. Davidson of Florida grows many succulents and cacti in an out-door garden. Stapelias grow rapidly and flower well in late summer. She has a dozen Kalanchoes, many Crassulas, and Euphorbias. Culture in Florida is quite different from other parts of the country.

Mrs. Henry Karkmeyer of Oroville, California, visited Curt Backeberg last summer. Mr. Backeberg sent his greetings to his friends in the Cactus and Succulent Society.

Mrs. Jennie Stevens of Detroit, Michigan, reports that her experience with "HyPonex" for cacti was unsatisfactory. The growth seemed weak and the plants couldn't take the winter cold in the attic. Since she stopped trying to fore the cacti she has not lost a single plant. She found "HyPonex" satisfactory for Epiphyllums.

EDITOR'S NOTES

Recent Visitors at the Editor's office (132 West Union, Pasadena) was Dr. E. J. Alexander of the New York Botanical Garden, and Ben Veldhuis of Hamilton, Canada. Mr. Veldhuis brought seedlings from his large nursery to prove that Canadian grown plants can rank with the best.

Many doctors are growers of cacti and other succulents. There is a scientific appeal and a diversion that is not found in many plant groups. We would like to hear from some of our doctor readers on this subject.

EPIPHYLLUM OBSERVATIONS

Bill Schlecter of Coolidge Rare Plant Gardens says that short-tubed flowers seem to last longer than the long-tubed ones because the former are nearer to *Heliocereus* parentage.

The large or small pot plant does not always affect the size of the flower. Vigorous plants, as a rule, produce normal flowers but too much growth may cause fewer flowers.

Proper amount of sun makes a more compact flower. Too much shade tends to produce a loose type of flower.

Many growers start feeding their Epiphyllum hybrids soon after flowering so that the plants may recuperate before fall.

Early flowers, those out of season, and the last flowers are sometimes smaller, lighter, or off-color.

AFFILIATE NOTES

Cactus and Succulent Society of California, Inc. Oakland, California

The January meeting saw the adoption of a new Constitution and By-Laws following a vote to Incorporate the Society. Pres. Paul Hutchison presided at the meeting. A program of lectures with a nomenclature table was announced for the winter months at the club rooms, and garden tours to members gardens will occupy the summer months. Plants for the display are supplied by the University of California Botanical Garden and also from the collections of members.

The speaker at the January meeting was Mr. Robert Rodin of the Department of Botany of the University who talked about "A Botanical Journey through South Africa, Rhodesia and Transvaal." Kodachrome motion pictures, kodachrome slides and living plants collected on this journey made the trip possible for all of us.

Mr. Alex Hawkes, also from the Department of Botany was the speaker at the February meeting. His subject, "Tropical Exotic Plants for the Succulent Grower" together with living plants revealed many unusual forms of orchids and palms and other tropical and subtropical subjects that blend with a cactus and succulent collection.

MAY G. MIKELSON, *Librarian.*

EDITOR'S NOTE: We have just learned that the Oakland Society is making the Cactus and Succulent Journal available to every member of their group of fifty. This is first Society to render such support to our twenty-three-year-old magazine.

USED BOOKS FOR SALE

Die Sukkulenten—Jacobsen. Original edition in German, bound $4.50

Materials for a Critical Revision of Crassulaceae—Schonland. Paper bound, rare $4.50

Kakteen—Schelle. Paper edition, 1926, in German with 197 illustrations of cacti $4.50

A Botanist in Southern Africa—Hutchinson. Out of print, one of the finest books ever published. 686 pages and hundreds of fine photos and drawings. 1946, cloth bound $18.50

Bound volume containing: *A Contribution for a better Understanding of Xerophytic Plants, Hummels Victory Picture Book, Colorado Cacti, Brazil and Its Columnar Cacti,* interleaved for notes $7.50

Bound volume containing: *Glossary of Succulent Plant Terms, Colorado Cacti, Brazil and its Columnar Cacti, Euphorbia Review* (complete) $12.50

Plant Geography—Schimper (very rare) 56.00

Abbey Garden Press, 132 W. Union St., Pasadena, Calif.

FIG. 33a. The skeleton structure of Arizona's Organ Pipe Cactus, *Lemaireocereus Thurberi* (Engl.) Br. & R. This interesting photograph by R. C. Proctor appeared in a recent issue of the *Saguaroland Bulletin* of the Desert Botanical Garden of Arizona, Tempe, Arizona. Active membership and Bulletin $2.00 per year.

TEXAS CACTI AGAIN AVAILABLE

We have obtained a good supply of this 1930 edition of "Texas Cacti" by Schulz and Runyon. When this supply is gone it will again become a rare book item. The 180 page book contains 63 photos of the cacti native to Texas with understandable descriptions. There are chapters on culture, distribution, and enemies, as well as a glossary and list of common names. Well indexed. Paper covers $3.75 postpaid.

Succulent Plants—Jacobsen. The revised edition of the most complete book on the other succulents is now available. There are over 300 illustrations with descriptions of 1000 species; mentions as many more in the 293 pages. English edition $6.15.

"The Enigma of the Origin of Monstrosity and Cristation in Succulent Plants" by J. J. Verbeek Wolthuys is now available as reprinted in Holland. The 112 page book is printed in two languages—Dutch on one page and English on the opposite page. There are 27 illustrations. The final word on the causes of monstrose and cristate plants has not been written but this book discusses the many and varied theories. Postpaid $1.00.

Cactus-Like Succulents—by E. Lamb is now ready for distribution. Twenty-three clear illustrations and descriptions of 70 interesting cactus-like species. Cloth bound $1.00 postpaid. Abbey Garden Press, 132 W. Union Street, Pasadena 1, California.

FIG. 34. *Peniocereus maculatus* plants about 10 years old. The one on the left was grown in open ground, the other was grown in a pot. Approx. one-third natural size.

PENIOCEREUS IS A SEXTETTE

By LADISLAUS CUTAK
Horticulturist, Missouri Botanical Garden

Although PENIOCEREUS intrigued me from the start, on account of its lovely flowers and peculiar root structure, I did not become a student of the genus until 1946, when I described *P. Fosterianus* from Guerrero, Mexico, as its fourth member. At that time, I came in contact with another related cactus whose juvenile growth greatly resembled the plant I was working on. This plant, *Cereus maculatus,* had been described by Wilhelm Weingart in Kakteenkunde (1933) from fragmentary dried flower material and juvenile cuttings. He had suggested

that it might be an Acanthocereus because of the winged appearance of the juvenile stems. Later, Helia Bravo published the cactus under *Acanthocereus maculatus,* erroneously attributing the name to Weingart.

As early as February, 1946, I had mentioned in the CACTUS JOURNAL that *Cereus* (Acanthocereus) *maculatus* appeared to be a true Peniocereus and that it would be transferred into that genus when the first flowers on cultivated specimens manifested themselves to insure its valid position. In the light of accumulated knowledge I now propose to make the transfer.

PENIOCEREUS MACULATUS (Weingart) Cutak, comb. nov.

Cereus maculatus Weingart, in Kakteenkunde, 1933, p. 14

Acanthocereus maculatus H. Bravo, in Anal. Inst. Biol. Mex. 3:398, 1932 (erroneously attributed to Weingart by Bravo)

Acanthocereus maculatus F. M. Knuth, in Backeb. & F. M. Knuth, Kaktus-ABC 1935, p. 303

An erect, sparsely branched shrub, 1-2 m. tall, from a fleshy carrot-like to turnip-shaped root-stock. Tubers on young plants 13 cm. long by 5 cm. in diameter, but apparently larger in older specimens. Stems and branches normally 3 or 4 winged, margins straight to slightly repand, 50 cm. long, 3 cm. wide, dull dark green, speckled with light green, often tinged purple. Areoles small, circular, 5-20 mm. apart, at first filled with whitish wool, later naked. Spines 6-9, very small, sharp, reddish brown to gray in age, mostly bulbose, 1-3 mm. long; radials usually 7 in number or occasionally with 2-3 longer, nearly acicular ones in the lower portion; central mostly solitary, very bulbose, usually extending straight out or when 2 are present pointing in opposite directions. Flower 9-10 cm. long, cream colored with reddish brown outer segments. Ovary green, with relatively scant areoles in lower half, 2 cm. long, 7.5 mm. in diameter; flower tube pinkish on the inside, 2.5 cm. long; stamens many, the inner ones attached to base of throat and along the wall, about 2 cm. long while the outer ones are only 5-10 mm. long; filaments white, the inner ones slightly pinkish at base; anthers linear, pale yellow, 2 mm. long, basifixed; style with extended stigma lobes slender, very pale greenish white, about 5 cm. long; stigma lobes 7, creamish, about 2 mm. long. Fruit not seen, but said to be red inside and out, inversely pyriform, 5 cm. long and 3 cm. in diameter.

Mexico: Guerrero. In Cañón del Zopilote, around Mexcala.

This cactus originally was sent to Wilhelm Weingart by Friederich Ritter from Campo Morado in September, 1932. It was noted to grow in comparatively good soil on the valley floors and upon the smooth slopes of river val-

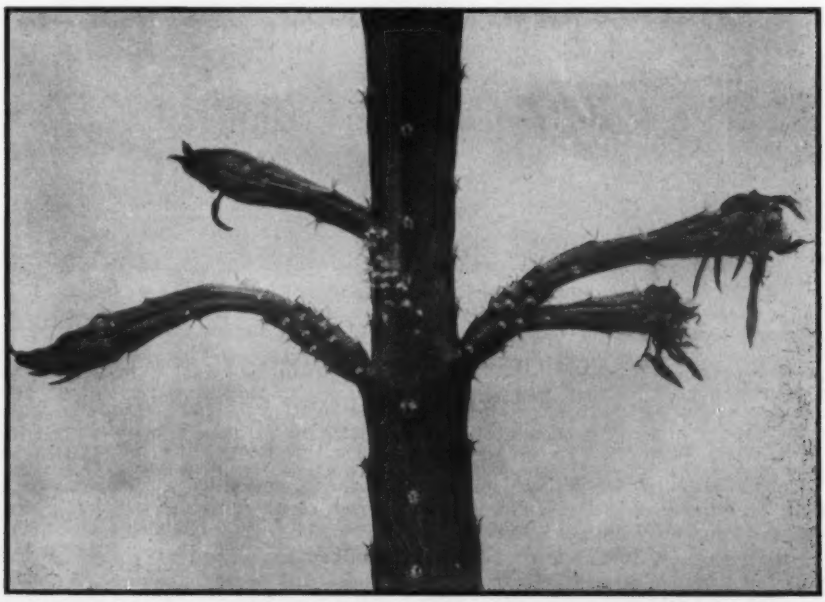


FIG. 35. *Peniocereus maculatus* showing flowers after anthesis. Approx. one-half natural size.

leys in Guerrero at an altitude of from about 300 to 800 meters in a subtropical climate. All the plants in cultivation apparently originate from seeds sold by H. Winter of Frankfurt, Germany, in whose catalog they were first advertised in 1937 or thereabouts. In the United States the first distributor was R. W. Kelly of Temple City, California, who already was offering small greenhouse grown plants in 1939 for one dollar. The Garden's two plants were acquired from Mr. Wm. Taylor Marshall and Mrs. Hazel Nevin, both of whom got them from Kelly's Nursery.

While working on my proposed new species, *P. Fosterianus,* Marshall sent me a young plant of *Cereus maculatus* in the fall of 1945. This plant was placed in the ground in the Cactus House where it remained until lifted in 1951 to make a photographic record of its tuber. In the course of correspondence with several cactophiles of the Los Angeles area who were growing this novelty, I learned that none of them had ever flowered it. I also learned that the plants occasionally were frosted, which might explain why they were retarded.

In the spring of 1947 John Poindexter mentioned that he had visited a lady in Greenfield, California, who was growing 'Acanthocereus maculatus' and noticed a fruit on it. I immediately got in touch with Mrs. Hazel Nevin. She bought her plant from Kelly as a seedling and at first thought it very pretty, but when it grew and began to sprawl around she lost interest in it. She, however, took lots of cuttings from the plant and accumulated material of various sizes. The original stump was offered to me, which of course, was accepted with open hands. It arrived in St. Louis in the fall of 1947. I kept the cactus in a dormant condition during the winter, hoping to coax blooms in 1948. The plant grew robust and set forth two long side shoots—one 20 inches long and the other 11 inches. The following year the longest branch was broken off by playful boys with whom a public place, like our institution, has to contend with. Since the plant failed to bloom in 1948 and 1949, it was decided to grow it outdoors in 1950 by plunging the pot in soil in the writer's backyard where it would get fresh air, rain and sufficient amount of sunshine.

In the meanwhile, one of Mrs. Nevin's young plants threw up ten buds in August, 1948. The buds were slow in developing and she wondered if they would ever reach maturity. In October (same year) they began to look as if they might unfurl. I asked her to ship via airmail this budded stem, which she was willing to do. Apparently airmail service was poor, for three days elapsed before the precious parcel arrived and

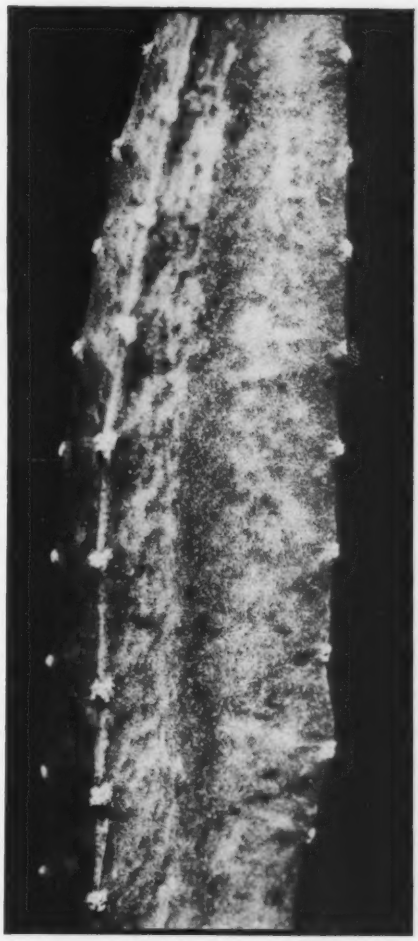


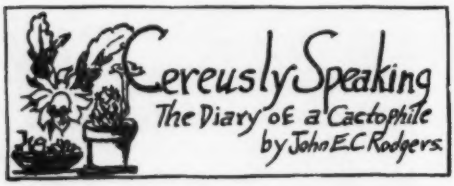
FIG. 36. *Peniocereus maculatus* showing the "marbling" on the stem and from whence its specific name comes. Slightly larger than natural size.

the flowers had passed anthesis in transit. However, the spent flowers gave every indication that the species rightfully belongs in Peniocereus. I purposefully withheld the transfer till now, hoping to secure better photographs and fuller description, but since I have in consideration a possible seventh member and a revision of the genus in the very near future, I decided to go ahead with it. The genus PENIOCEREUS is growing!

Cactus Growing for Beginners—Vera Higgins' Fourth printing. A valuable little book on how to make a cactus collection and how to grow them. $1.00.

ABBEY GARDEN PRESS

132 W. Union Street Pasadena, Calif.



Disocactus, Chiapasia, Epiphyllum, and *Nopalxochia* have well developed buds for late April and May. The last of *Schlumbergera Gaertneri* and the var. *Makoyanum* (brought from Brazil according to Watson in 1884 and flowers in July and August in England) are at the height of their flowering period. *Zygocactus truncatus* (introduced into England from Brazil in 1818) has new growth at the end of the pendant stems. The Parodias, Malacocarpus, Lobivias, Echinopsis, and Gymnocalyciums have new growth and buds. The Rebutias that bloom near the base are blooming now while those that set buds near the top in last year's growth are budded.

The southwestern U.S.A. species have flowers on *Echinocereus perbellus, berlandieri, pentalophus,* and *pectinatus; Mammillaria hemispherica, hyderii,* and *texensis. Echinocactus, Lophophora, Ariocarpus,* etc., show new "furry growth" which usually indicates buds as well. *Thelocactus* and *Hamatocactus* are showing new growth and the scaly buds. Those stored cool under a bench are as far along as those kept within a foot of the glass. Have kept some types in two places and results seem to be the same. Set those from under the bench on the back porch April 8 in full sun (when we get it) others to remain in same position for comparison.

Buds developing on two six-foot *Nyctocereus serpentinus* tied to four long staking wires used to hold up Chrysanthemums. I kept them this year within four feet of the stove. Buds and new growth on *Selenicereus nelsonii, vagans, pteranthus, "coniflorus,"* and *Leptocereus maxonii.* These are usually the first to flower. My grafted ten-headed crown of *Mam. barbata* has had over 100 flowers with the result that the *Cereus peruvianus* type of stock is badly shriveled. *Echinocereus berlandieri* and *perbellus* have buds towards the strong light in the storage room window. *Echinopsis kratochviliana, oxygona, albiflora, leucantha,* and *Meyeri* are showing buds, as they follow the Rebutias in the flowering schedule.

Opuntia compressa (hardy) and the varieties from Minnesota, North Dakota, Tennessee, and Indiana have been water-logged since last November. Gravelly soil is surrounded by water but they seem to be plumping up for summer growth and blooms. Ants carried seeds which have grown for two season on top of their "hill," perhaps they decided the "pads" make good roofing material when full grown.

Cereus mallisonii has had six large irridescent purple underlay old rose blooms and several more buds to open. *A. flagelliformis* has 3 new stems. I started from a 3 inch cutting. I've not been able to grow those three-foot stems I used to when I had less space and more ventilation. The question of watering and temperature still give me, much thought. Perhaps it is the "age" in which I began to collect. Then there was no literature available to help in the culture. Even now there is more descriptive information about plants than cultural. The Aporocacti all need a humus soil with plenty of well decayed manure content. The amount of light, the position, etc., do not seem to matter as the directions say keep all of them moist. I've found that during the early growth and flowering period (from October to June) Aporocacti want all the light and heat they can get with heavy weekly waterings. Enough so it runs through the drainage hole. Since this also demands root moisture I fit a tin can over the bottom of the pot to catch the run off.

This same culture method also works on the Epiphytes but since there is no protective lattice of spines, the stems usually bleach or turn reddish. I never worry as long as the under side of the stems away from the strong light stay green. The whole plant will assume the glossy green look again when put out in the summer in partial shade. However, the plants in the region of the Great Lakes never get bleached with our average from October through March of 49 days of sunshine.

The position of plants could be given further study, as the blooming time can be moved ahead as well as delayed by placing them in different zones of light, humidity, temperature, etc., as found from floor to glass of an ordinary greenhouse. There are definite bands of control in my greenhouse which do work through these variables to control the growth and flowering. *Schlumbergera gaertneri* blooms from three to four weeks earlier on the south side toward the strong light and winter heat from the hard coal burner even though the north side is against a white wooden wall. *Mammillaria barbata* and *bocasana* show the same results.

The Selenicereii set the earliest buds on the side toward the strong light and up toward the roof while the later ones develop on the shorter stems away from the strong light. If a continued hot spell comes on in late May the buds abort if they are in the early stages of development. May be due to strength being taken from buds by speed-up in growth.

Cereus validus and *argentinensis* are budded. Both are cuttings of plants from 8 to 12 feet high which are now two feet high in 4-inch pots. I was told they were gross feeders so I've used top dressings of vigoro and sand and cow or chicken manure. The buds form on the ribs away from the strong light where I have them.

Leptocereus maxonii has repeated its past two years of early budding. Buds have appeared on the ribs toward the strong light as before. The past history of the plant is interesting; it has been in the same 8-inch pot for the past seven years. I have had it for 10 years or more. For three years I kept it resting until early June; for 4 years growing in early spring on cool bench which did not work better than three previous years. It had the same top dressing, watering and care for these 7 years. Plant did not grow much during this time but when the added heat, light and moisture was given it responded. Evidently it did not want the "winter rest" but did want the 2½ foot from the glass under the free ventilation it gets when top ventilator is open (March to November).

I have had no heat in the greenhouse since March 30. The lowest temperature was 33° in a protected place on the back porch. I do not expect any more freezing temperature as my weather diary for the last 17 years shows this is not the late cold year. I do expect a cool, wet spring with a late hot summer and fall.

My timidness as to how much coolness I can allow is being put to the test. My losses have been less since I allow my succulents, inside and outside, to harden in a variety of fall temperatures. Good drainage is essential with all of them. Some Opuntias such as *O. elata* can stand in water, I've found. I have kept a three-foot specimen in a "butter crock" with no drainage and full of water. Keeps its stems and plumpness and grows.

The quickest rooting I've done of cuttings of Epiphytes, Selenicereii, Opuntias, Echinocereji, etc., has been clear glass containers partially filled with water with the cuttings held off the bottoms with wire cradles. I've had some succulents: *Selenicereus pteranthus, Aptenia cordifolia, Crassula lycopodioides, Kleinia articulata, K. pendula,* and *Hoya carnosa* growing for two to seven years (Hoya) in water. Firm growth but less vigorous than in soil due, no doubt, to limited amount of fertilizers I put in. Some stay dwarfed but resume normal growth when put in soil.

The Euphorbias have set very few seeds as most of my plants are one of a kind and usually have either staminate or pistillate flowers only. I have *E. obesa* of both sexes. I have grown a few Euphorbias from seed but prefer to buy fair sized seedlings and cuttings. I've grown Aloes from seed also. The only drawback is the percentage of germination is low. A soil of ordinary proportions has answered my seed growing efforts.

By the end of May the plants that are going to grow have started. Those that have lost their roots from various causes, should be checked. Cut root stubs back to clean tissue, dip in powdered charcoal, semesan, etc., and repot in new soil or pockets of sand in new soil. Often the wrong type of soil will keep a plant from growing. S. W. cacti can stand as high as ⅔ lime ruble (old plaster). I used some shale to conserve moisture in a pot of Rhipsalis, the plant sulked worse and worse as the shale rock pulverized. When I changed the soil to a humus type the plant resumed normal growth and has more than tripled in size.

The third application of a good fertilizer should now be worked and watered into the soil to insure good summer growth and the replacing of minerals lost through flowering and leaching of soil through rapid drainage by the middle of May.

There are plants I have not mentioned, the old faithfuls which I depend upon but forget to mention: Graptopetalums, Kleinas, Haworthias, Stapelias, Agaves, Faucarias, Othonna, Kleinias, Astrophytums, Senecios, Gasterias, Harrisias, Eriocereus, Lemaireocereus, etc. These have awakened, some have bloomed and others will, are growing in small pots, cramped quarters, poor light, too cool or too hot and all of the other things the plants of a cactophile (succulentphile) are heir to, but they do please me. If I have neglected these it is through oversight.

Remember these are the views, thoughts, and observations of John E. C. Rodgers and do not in any way keep the rest of you from disagreening with me.

JOHN E. C. RODGERS
1229—8th Street, Lorain, Ohio

ULTRA-VIOLET RAYS AND CACTI

By M. CLAGUE-TAYLOR

From *The National Cactus and Succulent Journal*
($3.00) Great Britain

It is unfortunate but true that in the British Isles rarely sufficient sunshine is experienced to compensate adequately for the unnatural living conditions under which the average collection of cacti is grown. It must be borne in mind that the cactus in its natural habitat lives in a dry atmosphere with long unbroken periods of brilliant sunlight, therefore it can be hardly surprising that many plants in English collections fail to thrive, and to produce the vividly coloured and strong spines that are their chief attraction, when one considers that the climate here is damp and that sunshine, on the rare occasions that it is experienced, is so very often adulterated by the atmosphere.

This applies particularly to the great cities and surrounding countryside where pollution of the air by smoke, dust and dirt particles is extreme. At the best of times our sunlight is a poor substitute for the burning sunshine of Mexico and other cactus countries.

To overcome this lack of sunshine has long been a problem but it appears to have been solved by utilising the ultra-violet rays of a modern mercury-arc treatment under a sunray lamp is approximately the equivalent of a full day's sunshine, and such treatment carried out every other day (save when the sun actually is shining) is quite sufficient to keep cacti in excellent condition.

I have found it easier to bring relays of plants, conveniently arranged on trays, to the lamp indoors rather than to take the lamp outside to the cacti, for the average glasshouse is too small to allow of sufficient space to position the lamp correctly and moreover the amount of waterproof cable required to run from an electric point indoors to the greenhouse is usually excessive.

My own collection of cacti has benefited greatly through this treatment; growth seems, in the majority of cases, to be much firmer and spines compare very favourably in strength and coloration with those of imported plants. Opuntias, in particular, seem to make greatly increased growth—a specimen of Opuntia horrida having developed ferocious spines up to 3 inches and more in length.

It is well to remember that in order to give the plants the maximum benefit of ultra-violet rays they must be rotated from time to time. A more satisfactory method to ensure even distribution of the rays is to make use of two or more mirrors which may be so arranged as to reflect the light on to the backs and sides of the plants which would otherwise be in shadow.

The distance at which the sunray lamp should be placed depends to a large extent on its power. In the case of the model I have used—a "Hanovia Homesun"—the correct distance is about 3 or 4 feet from the collection. Remember also that the lamp should be so placed as to shine downwards from slightly above the plants.

Mirrors, when used, may be positioned as near the plants as may be convenient, as reflected rays are not so powerful as those direct from the lamp.

Sunray treatment for cacti should, in my opinion, cease at the end of September to allow of their normal resting period.

CALIFORNIA OBSERVATIONS

Plants that seed themselves when planted in the open:

Glottiphyllum linguiforme
Aeonium valverdense
Aloe humilis
Crassula argentea
Kalanchoes
Rebutias

What others?

BORG'S BOOK AGAIN AVAILABLE

Cacti by Prof. J. Borg was first published in 1937 and proved to be a most valuable work for the keen amateur with its clear, non-technical descriptions. The author died in Malta in 1945 but he left a completed and revised manuscript which included another 300 or more species and 36 additional illustrations. This revised edition was printed in England and contains 520 pages and 128 photographs. Delivered in U.S.A. $6.50 (plus 20c sales tax on California sales). Order now from Abbey Garden Press and shipments will be made as the books are received.

ROUND ROBIN NEWS

Round Robin No. 1 flew in the other day just brimful of interesting letters with a few snapshots and clippings enclosed. Members of this Robin report that among their plants that are in bud or blooming are Gasterias, Haworthias, Stapelias, Kalanchoes and Rebutias. Mrs. Marry Karr writes enthusiastically about having a *Rebutia senilis* in bud. Maybe some know it better by the name of Wallflower Crown.

In Mrs. Mary Anderson's letter she inquires of Mrs. Ella Nipper how often she repots her Billbergia nutans. Mrs. Nipper advises her to keep new plants from old Billbergias and to pot them separately as the old one dies after blossoming but does leave at least one new plant. Mrs. Anderson writes: "The first time mine came out was on a Christmas morning. I did not know it was budding and when I came down and saw that rosy stem and that blue green butterfly my joy was audible."

Our Cape Cod member, Mrs. Gladys Panis, seems to be having fine results with her many seedlings only having lost one, an *Echeveria pulvinata*. She writes: "If anyone knows what I should do for the condition I describe, please let me know . . . the joints of the stems wither and dry up and the branch drops off. I have heard that root disturbances cause withering but in this case the main stem was not affected, only the branches. However, this Echeveria was a newly-started cutting and began to wither halfway up the main stem. Perhaps it could not support the plant with such a small root system. Once it started to go, nothing seemed to be able to save it and it does not grow out again but just dries up." Mrs. Panis' letter also had many helpful growing hints.

Miss Marion Fox speaks of having a *Rebutia violaciflora* which is rather a weird thing when in bloom. She turned her back to look at something and when she next looked at the Rebutia the blossom was vanishing. A grasshopper was gobbling it up. 'Hoppers and little kittens are rather destructive!

A Sand Dollar (*Astrophytum asterias*) coming into bloom on Easter Sunday was a pleasant surprise to Miss Marie Podgajsek of Ogema, Minnesota. She writes that her Rebutia, (Red Crown), bloomed after spending several years only making offsets. She attributes her success to taking off all the pups and potting the old plant separately.

We all admired a lovely picture Mrs. Ella Nipper enclosed of her *Epiphyllum oxypetalum* which she notes on the back of the picture has 17 open flowers and several buds and it blooms from about 9 to 11 p.m. and then the flowers are all closed by sun-up. Mrs. Nipper has given us much valuable help with our plants and never lets a question go unanswered.

Several spoke of having been to their annual flower shows. I went to the one in Boston which was bigger and better than ever. I particularly enjoyed Carter & Son's desert scene this year. It was quite large and at the back there was a wall to represent stucco with an Indian blanket thrown over part of it. Near the wall were the tall cacti of 8 feet or more. The litle ones were around the border. There were a number of Euphorbias attracting many of the visitors with their grotesque shapes. The *E. splendens* were large bushes just massed with flowers. *E. grandicornis* with its odd shape and *E. pseudo-cactus*, a large plant with green buds on its tips, and many, many others were really fascinating. The Old Man and Old Lady cactus plants amused many and were larger than our house plant varieties and very hairy. The Echeverias were all in bloom and there was also a very interesting-looking Rat Tail that drew many comments from the spectators. We had an additional attraction this year for some Epiphyllums from the Beahm Gardens in Pasadena arrived by a "Flying Tiger" air express to join the Carter exhibit. They must have enjoyed their plane trip for they looked as fresh and lovely as though they had been growing in Carter's desert for years. William de Laet attracted many who oh-ed and ah-ed over its 11 lovely buds with the top ones just bursting. Vive Rouge, always a favorite, had its share of attention. Sylvia Rosa was simply covered with tiny buds, beyond counting at a distance. I spent most of my time "on the desert" just dreaming. How I wished I could wrap it up and take it home with me!

I have an abundance of notes on the activities of Round Robin No. 2 which I had hoped to include in this write-up but shall have to save for a future issue.

* * *

The Euphorbia Robin has started out on its first flight with Mr. Leon W. Frost of Ft. Myers, Florida, as its director. It still has room for one more member. Mrs. Elbert H. Major of Lenox, Michigan, and Miss Rose B. White of San Rafael, California, have just joined this Robin.

The Succulent Robin is flying with a full and overflowing membership. There has been such interest shown in "succulents only" that a second Robin on this subject will be organized soon. Anyone wishing to poin, please write to me. Mrs. Karr of Otley, Iowa, is directing the first one.

The Dish Garden Robin, which is to include the button gardens and the terrarium, is growing but still needs a few more members to start.

Cactus and Succulent Round Robin No. 4 has room also for more members. We already have a director for this Robin.

I am very anxious to have an International Robin and hope that some of our overseas Society members will write to me. Any suggestions in regard to the best way of handling such a Robin will be most welcome.

Now, how about a Robin on the Living Stones? Since reading J. R. Brown's article and seeing the pictures in the Jan.-Feb. issue of the JOURNAL, I am all for a Lithops Round Robin. This type is not only fascinating, unusual and varied, the plants are small enough to fit nicely into an apartment where space is so limited for plants. One could have a good-sized collection.

This is about all there is to report this time except to say that the happiness expressed in the Robins for this added activity of the JORNAL makes it all very worthwhile. Appreciation has also been mentioned in regard to the Amateur Page conducted by Mr. Sherman E. Beahm. It seems as though we now have a well-rounded-out JOURNAL for all to enjoy and participate in its pages, thanks to our Editor.

MABEL H. FAY
123 North Avenue, N. Abington, Mass.

EPIPHYLLUM SHOW

Cactus Pete, 5440 Valley Blvd., Los Angeles, is presenting their 12th Show of Epiphyllums. Open daily until June 19th. Visitors are always welcome. Orchid cacti are about two weeks late this season and at this time the flowers are at their best. Don't miss this colorful showing.

* * *

THE MAMMILLARIA HANDBOOK—Dr. R. T. Craig, on Mammillarias, contains 400 pages bound in heavy buckram and the same size as the smaller edition of the Britton and Rose Reprint. There are 236 species fully described and illustrated with 300 photographs. $7.50. Postage in U.S.A. 15c, foreign 50c. Abbey Garden Press, 132 W. Union St., Pasadena 1, Calif.

SOME RESULTS OF TWENTY YEARS OF CACTUS RESEARCH[1]

By CURT BACKEBERG

PART II

An annotated list of my new genera, species, varieties and combinations (continued)

SUBNATIO 2. Chaetolobiviae

87. *Mediolobivia* Backbg., 1934b, Blätt. f. Kakteenf., 1934-2. Type: *Mediolobivia aureiflora* Backbg. This is a genus of proliferous plants of small, low-tubercled, rebutioid bodies, but the flowers not naked as in *Rebutia*. The flowers are slender-funnelform, with slightly hairy tube and a few bristles. In subgenus 1 the style is a little coalescent with the tube; in subgenus 2, entirely free. The fruits are small, with thin skin, drying and crumbling.

Subg. 1. *Pygmaeolobivia* Backbg. 1942a, Cact. Jahrb. DKG.: 76.
First described without Latin diagnosis as a subgenus of *Lobivia*, in Backeberg & Knuth, 1935, Kaktus-ABC: 239. Type: *Rebutia haagei* Frič & Schelle. Syn. *Digitorebutia* and *Cylindrorebutia*, both nomena nuda of Frič & Kreuzinger, 1938.

Mediolobivia atrovirens (Backbg.) Backbg., in Krainz, 1947, Jahrb. Schw. KG.: 19. Syn. *Lobivia atrovirens* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 242, 414.

M. digitiformis (Backbg.) Backbg., in Krainz, 1947, Jahrb. Schw. KG.: 19. Syn. *Lobivia digitiformis* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 242, 414.

M. euanthema (Backbg.) Krainz, 1947, Jahrb. Schw. KG.: 19. Syn. *Lobivia euanthema* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 240, 414. First described without Latin diagnosis in Backeberg, 1935i, Blätt. f. Kakteenf., 1935-9.

M. eucaliptana (Backbg.) Krainz, 1947, Jahrb. Schw. KG.: 19. Syn. *Lobivia eucaliptana* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 240, 414.

M. haagei (Frič & Schelle) Backbg., 1942a, Cact. Jahrb. DKG.: 35. Syn. *Lobivia neohaageana* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 243, 415.

M. haagei var. *flavovirens* (Backbg.) comb. nov. Syn. *Lobivia neohaageana* var. *flavovirens* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 243, 415.

M. orurensis (Backbg.) Backbg., 1942, Fedde Rep.: 65. Syn. *Lobivia orurensis* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 243, 415.

M. pectinata (Backbg.) Backbg., in Krainz, 1947, Jahrb. Schw. KG.: 19. Syn. *Lobivia pectinata* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 243, 415.

M. pygmaea (R. E. Fries) Krainz, 1947, Jahrb. Schw. KG.: 19. Syn. *Lobivia pygmaea* (R. E. Fries) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 241.

M. pygmaea var. *longispina* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 28.

M. steinmannii (Solms-Laub.) Krainz, 1947, Jahrb. Schw. KG.: 19. Syn. *Lobivia steinmannii* (Solms-Laub.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 243.

Subg. 2. *Eumediolobivia* Backbg., 1942a, Cact. Jahrb. DKG.: 35.
Type: As for the genus. Syn. *Setirebutia* nomen nudum, in a list by Frič, 1934.

M. aureiflora (Backbg.) Backbg., 1934b, Blätt. f. Kakteenf., 1934-2. Syn. *Rebutia aureiflora* Backbg., 1932f, Der Kakteen-Fr.: 124.

M. aureiflora var. *albilongiseta* Backbg., 1934b, Blätt. f. Kakteenf., 1934-2.

M. aureiflora var. *albiseta* Backbg., 1934b, Blätt. f. Kakteenf., 1934-2.

M. aureiflora var. *albispina* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 33.

[1]Edited by E. Yale Dawson.

M. aureiflora var. *brevispina* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 33.

M. aureiflora var. *leucolutea* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 33.

M. aureiflora var. *variegata* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. teenf. (catalog): 33.

M. aureiflora var. *longiseta* Backbg., 1934b, Blätt. f. Kakteenf., 1934-2.

M. aureiäora var. *variegata* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 33.

M. boedekeriana Backbg., 1934b, Blätt. f. Kakteenf., 1934-2.

M. duursmaiana Backbg., 1934i, Blätt. f. Kakteenf., 1934-9.

M. elegans Backbg., 1934i, Blätt. f. Kakteenf., 1934-9.

M. elegans var. *gracilis* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 33.

M. longiseta nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 33.

M. rubelliflora Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 247, 415. This reddish-orange flowering plant may be a natural hybrid between the pure red flowering *M. rubriflora* and the yellow flowered *M. aureiflora,* or the former two may be varieties of the latter which is polymorphic like some *Lobivia* species.

M. rubriflora Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 247, 415. Syn. *Mediolobivia erythrantha* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 32. *Mediolobivia carminata* nomen nudum, a name attributed to Backeberg by Krainz, 1947, Jahrb. Schw. KG.: 20. It also seems clear that *M. blossfeldii* (Werd.) Wessner (1940a) and *M. sarothroides* (Werd.) Buin. belong here.

88. *Aylostera deminuta* (Web.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 274.

A. deminuta var. *pseudominuscula* (Speg.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 274. This represents the type of the genus *Aylostera* Spegazzini (1923: 17).

A. fiebrigii (Guerke) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 274.

A. kupperiana (Boed.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 275.

A. pseudodeminuta (Backbg.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 275. Syn. *Rebutia pseudodeminuta* Backbg., 1933a, Der Kakteen-Fr.: 7; 1934h, Blätt. f. Kakteenf., 1934-8.

A. pseudodeminuta var. *albiseta* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 275, without Latin diagnosis. As validating diagnosis: Differt aculeis longioribus, albidis, apice fuscato.

A. pseudodeminuta var. *grandiflora* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 275, without Latin diagnosis. As validating diagnosis: Differt flore majore.

A. pseudodeminuta var. *schneideriana* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 275, without Latin diagnosis. As validating diagnosis: Differt aculeis spissis.

A. pseudodeminuta var. *schumanniana* Backbg., 1933a, Der Kakteen-Fr.: 7.

A. spegazziniana (Backbg.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 276. Syn. *Rebutia spegazziniana* Backbg., 1933a, Der Kakteen-Fr.: 6; 1934b, Blätt. f. Kakteenf., 1934-2. The variety which includes the type has brownish spines.

A. spegazziniana var. *atroviridis* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 276, without Latin diagnosis. As validating diagnosis: Differt corpore glauco, aculeis areolisque albidis.

A. spinosissima (Backbg.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 275. Syn. *Rebutia spinosissima* Backbg., 1935i, Blätt. f. Kakteenf., 1935-8.

SUBNATIO 3. Gymnolobiviae

89. *Rebutia* K. Sch. Syn. *Eurebutia* nomen nudum, in a commercial list by Frič, 1931. In subgenus 1, *Eurebutia* Backbg., the style is entirely free; in subgenus 2, *Neorebutia* Bewerunge, it is a little coalescent with the tube.

89. *Rebutia* K. Sch. Syn. *Eurebutia* nomen nudum, in a commercial list by Frič, 1931.

Type: *Rebutia minuscula* K. Sch.

R. chrysacantha Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 276, 416.
R. grandiflora Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 277, 416.
R. knuthiana Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 277, 416. This rare species which looks like *R. violaciflora* but has a flower like *R. minuscula* has disappeared from collections and needs to be recollected in Salta, Argentina.
R. senilis Backbg., 1932f, Der Kakteen-Fr.: 124-125.
R. senilis var. *aurescens* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 278, 416.
R. senilis var. *breviseta* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 278, 416.
R. senilis var. *elegans* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 38.
R. senilis var. *hyalacantha* Backbg., 1932g, Der Kakteen-Fr.: 131.
R. senilis var. *lilacino-rosea* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 278, 416.
R. senilis var. *stuemeri* Backbg., 1932g, Der Kakteen-Fr.: 131. Syn. *Rebutia senilis* var. *stuemeriana* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 278, 416.
R. senilis var. *violaciflora* nomen nudum, in Backeberg, 10 Jahre Kakteenf. (catalog): 38.
R. violaciflora Backbg., 1935h, Blätt. f. Kakteenf., 1935-8.
R. violaciflora var. *luteispina* nomen nudum, attributed to Backeberg by Krainz, 1947, Jahrb. Schw. KG.: 22.
R. xanthocarpa Backbg., 1932g, Der Kakteen-Fr.: 131.
R. xanthocarpa var. *citricarpa* Frič ex Backeberg, in Backeberg & Knuth, 1935, Kaktus-ABC: 278-279, without Latin diagnosis. As validating diagnosis: Differt fructu citrino. Syn. *Rebutia citricarpa* nomen nudum in a commercial list of Frič
R. xanthocarpa var. *dasyphrissa* (Werd.) Backbg., in Koehler, 1939, Beitr. Sukkulentenk.-pflege: 3. Syn. *Rebutia xanthocarpa* var. *coerulescens* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 279, without Latin diagnosis. *Rebutia dasyphrissa* Werdermann, 1935, Blühene Kakteen: pl. 103.
R. xanthocarpa var. *elegans* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 279, without Latin diagnosis. As validating diagnosis: Differt saetis longioribus, tenuibus, costis spiralibus.
R. xanthocarpa var. *luteirosea* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 279, without Latin diagnosis. As validating diagnosis: Differt flore flavido-roseo pallido.
R. xanthocarpa var. *pallidior* Backbg., 1932g, Der Kakteen-Fr.: 132.
R. xanthocarpa var. *salmonea* Frič ex Backeberg, in Backeberg & Knuth, 1935, Kaktus-ABC: 279, without Latin diagnosis. As validating diagnosis: Differt flore salmoneo.

Natio 8. Austroechinocacti

90. *Austrocactus* Br. & R. I regard the Castellanos & Lelong (1943) "emendation" of this genus as superfluous, for it is based on data from only a single species.
A. gracilis Backbg., 1942e, Beitr. Sukkulentenk.-pflege: 58. This is a slender species from Lat. 41° S. at 800-1000 meters: Rio Negro, northern Neuquén, Argentina.
A. patagonicus (Web.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 265.

91. *Pyrrhocactus* Berger. I include here only those closely related species which grow in Argentina and have rather short-tubed, cup-shaped flowers in which the ovary and tube are more or less bristly and the pistil not purple. The reduction of this genus under *Notocactus* by Castellanos & Lelong, 1943: 99, appears to be explained by their insufficient knowledge of the quite different flowers.
P. catamarcensis (Web.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 262.
P. dubius Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 263, 415.
P. umadeave (Werd.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 264.

92. *Brasilicactus* Backbg., 1942a, Cact. Jahrb. DKG.: 36, 69. Type: *Echinocactus graessneri* K. Sch. Syn. *Notocactus* subg. *Acanthocephala* Backbg., in Backeberg &

Knuth, 1935, Kaktus-ABC: 256. *Acanthocephala* (Backbg.) Backbg., 1938e, Blätt. f. Kakteenf., 1938-6. These plants are characterized by their peculiar small, short-tubed, spiny flowers and small, round, spiny fruits. Although recognized still by most authors under *Notocactus,* I consider them entirely distinct.

B. graessneri (K. Sch.) Backbg., 1942a, Cact. Jahrb. DKG.: 36. Syn. *Acanthocephala graessneri* (K. Sch.) Backbg., 1938e, Blätt. f. Kakteenf., 1938-6.

B. haselbergii (K. Sch.) Backbg., in Schaff, 1942, Beitr. Sukkulentenk.-pflege: 38.

93. *Parodia alacriportana* Backbg. & Voll, in Backeberg, 1949h, Arqu. Jard. Bot. Rio de Janeiro: 166.

P. aureicentra Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 268, 416.

P. aureicentra var. *lateritia* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 17.

P. aureispina Backbg., 1934g, Blätt. f. Kakteenf., 1934-7.

P. aureispina var. *elegans* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 268, without Latin diagnosis.

P. carminata Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 268, 416.

P. catamarcensis Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 269, 416.

P. chrysacanthion (K. Sch.) Backbg., 1935c, Blätt. f. Kakteenf., 1935-3.

P. chrysacanthion var. *leucocephala* nomen nudum, attributed to Backeberg by Krainz, 1945.

P. faustiana Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 266, 415.

P. faustiana var. *tenuispina* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 266, 415.

P. gummifera Backberg & Voll, in Backeberg, 1949h, Arqu. Jard. Bot. Rio de Janeiro: 166.

P. maassii var. *atroviridis* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 270, without Latin diagnosis.

P. maassii var. *rectispina* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 270, without Latin diagnosis. As validating diagnosis: Differt aculeis rectis.

P. microsperma var. *macrancistra* subvar. *leucantha* nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 17.

P. microthele Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 266, 415.

P. mutabilis Backbg., 1934g, Blätt. f. Kakteenf., 1934-7. The variety which includes the type has brownish spines.

P. mutabilis var. *carneospina* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 271, without Latin diagnosis. As validating diagnosis: Differt aculeis carneis.

P. mutabilis var. *elegans* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 271, without Latin diagnosis.

P. mutabilis var. *ferruginea* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 271, without Latin diagnosis.

P. nivosa Frič ex Backeberg, 1934l, Blätt. f. Kakteenf., 1934-12. Syn. *Microspermia nivosa* nomen nudum in commercial lists of Frič.

P. rubricentra Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 267, 415.

P. sanguiniflora Frič ex Backbg., 1934l, Blätt. f. Kakteenf., 1934-12. The flowers of this plant are larger than those of *P. erythrantha* and bluish-red, rather than brick-red. Syn. *Microspermia sanguiniflora* nomen nudum in commercial lists of Frič.

P. schwebsiana (Werd.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 271.

P. schwebsiana var. *salmonea* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 272, without Latin diagnosis. As validating diagnosis: Differt flore salmoneo.

P. scoparia Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 272, 416. The deep orange-red flowers of this species are larger than those of *P. mutabilis.* The habit is similar but more elegant, with neat tubercles and finer spines.

P. setifera Backbg., 1934g, Blätt. f. Kakteenf., 1934-7. The name was originally misprinted "*P. setifer.*"

P. setifera var. *nigracentra* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 272, without Latin diagnosis.

P. setifera var. *orthorhachis* Backbg., in Backeberg &Knuth, 1935, Kaktus-ABC: 272, without Latin diagnosis.

P. stuemeri (Werd.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 272.
P. tilcarensis (Werd. & Backbg.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 268. Syn. *Echinocactus stuemeri* var. *tilcarensis* Werd. & Backbg., in Backeberg, 1931, Neue Kakt.: 89.

94. *Malacocarpus* S.-D. Whereas Britton and Rose, 1922, recognized a miscellany of species of various genera in *Malacocarpus,* I restrict this genus to that group of which *Echinocactus corynodes,* as the first species listed by Salm-Dyck under his genus, may be considered type. It is characterized by woolly tops, yellow flowers with purplish style, and pinkish or white, soft, berry-like fruits. The fruits are remarkable in that they are elongated when ripe, and in that they do not mature until the next spring after flowering.
M. leucocarpus (Arech.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 252.
M. stegmannii nomen nudum, in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 17.
M. vorwerkianus (Werd.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 253.

95. *Eriocactus* (K. Sch.) Berg., emend. Backbg., 1942a, Cact. Jahrb. DKG.: 36, 69, 76. Type: *Echinocactus schumannianus* Nic. Syn. *Notocactus* subg. *Eriocephala* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 256. *Eriocephala* (Backbg.) Backbg., 1938e, Blätt. f. Kakteenf., 1938-6. This genus is characterized by cereoid habit in age, woolly apices, rather large flowers with short tubes and yellow pistil, and fruits which are round, solid and circumscissile at their bases.
E. lenninghausii (Haage fil.) Backbg., 1942a, Cact. Jahrb. DKG: 37; in Schaff, 1942, Beitr. Sukkulentenk. pflege: 38.
E. schumannianus (Nic.) Backbg., 1942a, Cact. Jahrb. DKG: 37. Syn. *Eriocephala schumannianus* (Nic.) Backbg., 1938e, Blätt. f. Kakteenf., 1938-6. *Eriocactus grossei* (K. Sch.) Backbg., in Schaff, 1942, Beitr. Sukkulentenk.-pflege: 38.

96. *Notocactus* (K. Sch.) Berg., emend. Backbg., 1938e, Blätt. f. Kakteenf., 1938-6. Type: *Cactus ottonis* Lehm. This genus was restricted by the emendation to those species which are of globular form, lack wool at the apex and have infundibuliform flowers with violet pistils, and tubes with wool and bristles.

Subgenus 1. *Eunotocactus* Backbg., 1950f, Cact. & Succ. Journ. Am.: 153. Type: as for the genus. This subgenus is characterized by fruits which remain more or less round and fleshy and split at maturity with 2-3 lateral fissures.

Subgenus 2. *Neonotocactus* Backbg., 1950f, Cact. & Succ. Journ. Am.: 153. Type: *Echinocactus mammulosus* Lemaire. This subgenus is characterized by fruits which become elongated at maturity, more or less hollow, and decay at their bases.

N. caespitosus (Speg.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 253.
N. floricomus var. *flavispinus* Backbg. & Knuth, 1935, Kaktus-ABC: 254, without Latin diagnosis. As validating diagnosis: Differt aculeis flavidis.
N. floricomus var. *rubrispinus* Backbg. & Knuth, 1935, Kaktus-ABC: 254, without Latin diagnosis.
N. mueller-melchersii Frič ex Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 254, 415.
N. ottonis var. *elegans* Backbg. & Voll, in Backeberg, 1949h, Arqu. Jard. Bot. Rio de Janeiro: 172.
N. ottonis var. *villa-velhensis* Backbg. & Voll, in Backeberg, 1949h, Arqu. Jard. Bot. Rio de Janeiro: 172.

97. *Frailea alacriportana* Backbg. & Voll, in Backeberg, 1949h, Arqu. Jard. Bot. Rio de Janeiro: 173-174.
F. aurea Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 247, 415.
F. castanea Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 248, 415. Syn. *Frailea asterioides* Werdermann, 1938, Blühd. Kakteen: pl. 139.
F. colombiana (Werd.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 248.
F. pulcherrima (Arech.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 249.

98. *Blossfeldia* Werd. It is evident from the observations of Krainz, 1949, that the genus

Blossfeldia differs from *Frailea* Br. & R. only in that the flowers have only hairs (bristles wanting). Although it has been quite generally accepted without argument, even by a relatively conservative element among cactologists, it stands as a much less satisfactorily distinguished genus than many genera of mine which have not as yet enjoyed such recognition. From recent reports it appears that the plants have a much wider distribution than was at first supposed.

99. *Soehrensia* (Backbg.) Backbg., 1942a, Cact. Jahrb. DKG.: 76. Syn. *Eriosyce* subgenus *Soehrensia* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 273. Type: *Lobivia bruchii* Br. & R. These rather large, globular plants, up to 1.2 meters high, represent an eastern parallelism to the Pacific Andean *Eriosyce* and a southern parallelism to *Echinocactus* of the northern hemisphere. They cannot be regarded as species of *Lobivia*. Characteristic are their large, globular forms, their rather short, stout, relatively small, woolly, non-bristly flowers from near the apex.

S. bruchii (Br. & R.) Backbg., 1938e, Blätt. f. Kakteenf., 1938-6. Syn. *Eriosyce bruchii* (Br. & R.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 273.

S. grandis (Br. & R.) Backbg., 1938e, Blätt. f. Kakteenf., 1938-6.

S. ingens Britton & Rose sp. nov. This plant was described by Britton and Rose, 1922: 59, but without specific name. Of it they said: "similar [to *S. grandis*] but the flowers much smaller, being only about 3 cm. long, and the plant much larger, up to 12 dm. high. This plant is referred to [*Lobivia*] with hesitancy; it is much larger than any of the other species." Since it is now possible to interpret this plant more clearly, it seems well to validate it in the literature by a Latin diagnosis: *Soehrensia grandis* similis sed corpore grande, globose, usque ad 1.2 m. alto; floribus minoribus, solum 3 cm. longis.

TYPE: Shafer No. 23, at 2400 meters between Andalgála and Concepción, Argentina, Dec. 28, 1916.

I have seen photographs of this plant which might be called the "Argentine *Echinocactus ingens*." The tall plant illustrated by Castellanos & Lelong, 1943, plate 58d, from near Tucumán, El Molle, may represent this species.

S. korethroides (Werd.) comb. nov. Syn. *Eriosyce korethroides* (Werd.) Backbg., 1937a, Blätt. f. Kakteenf., 1937-1. *Echinopsis korethroides* Werd., in Backeberg, 1931, Neue Kakt.: 84. In this species the plants are up to 30 cm. in diameter and may be in groups. The red flowers are 6-7 cm. long.

100. *Oroya neoperuviana* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 282, 416. This species differs from *Oroya peruviana* (K. Sch.) Br. & R. in that it has more ribs and spines, is very variable in color, and is not so freely flowering.

101. *Neowerdermannia chilensis* Backbg., 1936t, Cact. & Succ. Journ. Am.: 73. This may be a very old genus. Unlike all other genera characteristic of the eastern slope of the Cordilleras which lack, as far as is now known, any representatives on the western side, this species of *Neowerdermannia* occurs on the western slopes of the high, north-Chilean Andes.

N. vorwerkii var. *gielsdorfiana* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 285, without Latin diagnosis. First mentioned in Backeberg, 1934u, Der Kakteen-Fr.: 64. As validating diagnosis: Differt flore lilacino-albido.

102. *Weingartia* Werd. Syn. *Spegazzinia* Backbg., 1933j, Der Kakteen-Fr.: 90, a name preoccupied by *Spegazzinia* Saccardo, a fungus genus. Five species are now known of this characteristic group, four with yellow, and one with purple flowers.

W. ambigua (Hildm.) comb. nov. Syn. *Neoporteria ambigua* (Hildm.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 259; *Chilenia ambigua* (Hildm.) Backbg., 1939, Kakteenkunde: 82. When the last known specimen of Hildmann's plant flowered for me in 1950 it was seen that it belongs to *Weingartia*. It has no turnip-root; the flowers are purplish-violet, about 2.5 cm. in diameter, with erect stamens, short, scaly, naked tube and ovary; the fruit is small and scaly as in the other species.

W. fidaiana (Backbg.) Werd. Syn. *Spegazzinia fidaiana* Backbg., 1933q, Der Kakteen-Fr.: 117. Type locality: near Tupiza, Bolivia.

W. hediniana Backbg., 1950c, Kakteen und andere Sukk.: 2-3. This plant does not

have a turnip-root; it has very woolly areoles and the apex is woolly in age. The plants are dark green, with longer, stiffer spines than in *W. cumingii* and stouter tubercles. Type locality: probably from the Potosi district, Bolivia (collected by Walterspiel).

W. neocumingii Backbg., 1950c, Kakteen und andere Sukk.: 2. Syn. *Echinocactus cummingii* Salm-Dyck, 1850. *Lobivia cumingii* Br. & R., 1922: 59, not *Echinocactus cumingii* Hopffer. This species is based on the description and figure of Britton and Rose which appeared erroneously under the name of Hoffer's species.

W. neumanniana (Backbg.) Werd. Syn. *Spegazzinia neumanniana* Backbg., 1933j, Der Kakteen-Fr.: 90-91. This plant has turnip-roots and pale orange flowers. Type locality: The quebradas near Humahuaca, Argentina.

103. *Brachycalycium* Backbg., 1942a, Cact. Jahrb. DKG.: 38, 76. Type: *Brachycalycium tilcarense* Backbg. This genus is a relative of *Gymnocalycium* with rather large bodies. The type species from near Tilcara in north Argentina is up to 40 cm. high and 24 cm. in diameter. The stout, campanulate, nearly tubeless flowers appear from a groove-like cut (!) in the upper tubercle. Such an areolar groove is not known in any other South American globular form. The pistil is very short.

B. tilcarense (Backbg.) Backbg., 1942a, Cact. Jahrb. DKG.: 78. Syn. *Gymnocalycium saglione* var. *tilcarense* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 295, without Latin diagnosis. This may be the same plant as that collected by P. L. Porte in 1920 for Britton and Rose at Lagunillas, southeast Bolivia, and of which the American authors say "this may or may not belong to *G. saglione*." Their description mentions a very short tube.

104. *Gymnocalycium albispinum* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 285, 416. This species has interwoven, bristly white spines, and more and looser perianth segments than in *G. bruchii* with which it is related.

G. baldianum (Speg.) Speg., 1925: 135. Syn. *Gymnocalycium venturianum* Backbg., 1934r, Kaktusář: 67. *Gymnocalycium venturii* nomen nudum in a list by Frič, 1929. *Gymnocalycium sanguiniflorum* (Werd.) Werd. The red flower color of this plant is somewhat variable and explains why Hosseus (1939) regarded *G. baldianum* as distinct from *G. sanguiniflorum*.

G. bruchii (Speg.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 286.

G. bruchii var. *hossei* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 286, without Latin diagnosis. A variant with long-tipped perianth-segments.

G. capillaense (Schick) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 287.

G. castellanosii Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 287, 416.

G. chubutense (Speg.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 287. This species is related to *G. gibbosum*, but is well distinguished. It is ash-gray, depressed, has a large, naked apex and 5 ash-colored spines. The ribs are very flat and the tubercles sharp-edged, not rounded as in *G. gibbosum*.

G. gibbosum var. *nigrum* Backbg., 1936f, Blätt. f. Kakteenf., 1936-6, without Latin diagnosis. A variant with pinkish-white flowers.

G. grandiflorum Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 289, 417.

G. hypopleurum (K. Sch.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 289.

G. leeanum var. *netrelianum* (Monv.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 290.

G. leeanum var. *brevispinum* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 291, without Latin diagnosis. As validating diagnosis: Differt aculeis brevioribus appressis; flore breviore.

G. loricatum var. *cachensis* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 296 ,without Latin diagnosis.

G. mazanense Backbg., 1932g, Der Kakteen-Fr.: 133; 1935b, Blätt. f. Kakteenf., 1935-2.

G. mazanense var. *breviflorum* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 291, without Latin diagnosis.

G. mazanense var. *ferox* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 291, without Latin diagnosis.

G. mazanense var. *rhodantherum* (Boed.) Backbg., in Backeberg & Knuth, 1935,

Kaktus-ABC: 291.

G. mostii var. *kurtzianum* (Guerke) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 292.

G. nidulans Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 293, 417.

G. nigriareolatum Backbg., 1934e, Blätt. f. Kakteenf., 1934-5. This plant has large, felty areoles, the old ones becoming blackish.

G. nigriareolatum var. *densispinum* nomen nudum in Backeberg, 1937m, 10 Jahre Kakteenf. (catalog): 16.

G. ochoterenai Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 293, 417.

G. ochoterenai var. *cinereum* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 293, 417.

G. oenanthemum Backbg., 1934i, Blätt. f. Kakteenf., 1934-9. This plant has wine-red flowers which are self-fertile as those of the other red-flowering species: *G. baldianum*.

G. proliferum Backbg., 1932g, Der Kakteen-Fr.: 132.

G. proliferum var. *calochlorum* (Boed.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 295.

G. spegazzinii var. *major* Backbg., 1936d, Blätt. f. Kakteenf., 1936-4, without Latin diagnosis. As validating diagnosis: Differt corpore aliquid elongato, majore, glauco (ad 22 cm. alto), 9 aculeis crassioribus.

G. weissianum Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 296, 417.

G. weissianum var. *atroroseum* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 296, without Latin diagnosis.

G. weissianum var. *cinerascens* Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 296, without Latin diagnosis.

105. *Neochilenia* Backbg., 1942a, Cact. Jahrb. DKG.: 39, 76. Type: *Echinocactus jussieui* Monv. Syn. *Neoporteria* Br. & R. sensu Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 258; Backeberg, 1938e, Blätt. f. Kakteenf., 1938-6. *Nichelia* nomen nudum in Bullock, 1938: 296. *Chilenia* Backbg. sensu Backbg., 1939, Kakteenf.: 82, non Backeberg, 1938e, Blätt. f. Kakteenf., 1938-6. As to the history of this genus and its confusion of names, see Backeberg, 1939: 79-82. This genus embraces the globular Chilean species with funnelform, open, rotate flowers, with hairy tubes, bristly above, with pinkish or creamish colored styles and hairy fruits.

N. chilensis (Hildm.) comb. nov. Syn. *Chilenia chilensis* (Hildm.) Backbg., 1939, Kakteenk.: 82. This plant has pink flowers. The perianth segments are not connivent. A good flower photo is given by Duursma, 1935, under the name *Neoporteria chilensis*.

N. ebenacantha (Monv.) comb. nov. Syn. *Chilensia ebenacantha* (Monv.) Backbg., 1939, Kakteenk.: 82.

N. fobeana (Mieckley) comb. nov. Syn. *Neoporteria fobeana* (Mieckley) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 259. *Chilenia fobeana* (Mieckley) Backbg., 1939, Kakteenk.: 82.

N. fusca (Muehlpfrdt.) comb. nov. Syn. *Chilenia fusca* (Muehlpfrdt.) Backbg., 1939, Kakteenk.: 82.

N. jussieui (Monv.) comb. nov. Syn. *Chilenia jussieui* (Monv.) Backbg., 1939, Kakteenk.: 82.

N. kunzei (Foerst.) comb. nov. Syn. *Neoporteria kunzei* (Foerst.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 260. *Chilenia kunzei* (Foerst.) Backbg., 1939, Kakteenk.: 82.

N. napina (Phil.) comb. nov. *Neoporteria napina* (Phil.) Backbg., 1935i, Blätt. f. Kakteenf., 1935-9. *Chilenia napina* (Phil.) Backbg., 1939, Kaktenk.: 82.

N. occulta (Phil.) comb. nov. Syn. *Chilenia occulta* (Phil.) Backbg., 1939, Kakteenk.: 82.

N. odieri (Lem.) comb. nov. Syn. *Neoporteria odieri* (Lem.) Backbg., in Backeberg & Knuth, 1935, Kaktus-ABC: 261. *Chilenia odieri* (Lem.) Backbg., 1939, Kakteenk.: 82.

To be continued

FIG. 37. *Castellanosia* gen. nov. Cárdenas.

NEW BOLIVIAN CACTI, II.

By MARTIN CARDENAS

Many regions of Bolivia have never been explored by botanists interested especially in cacti. Dr. J. N. Rose and Mr. Curt Backeberg explored parts of the highlands about La Paz, Oruruo, Cochabamba, and Tupiza, but a large portion of Bolivia, especially the eastern lower mountain and plains areas, have not been studied. In these regions are to be found some of the most interesting, from a phylogenetical point of view at least, of all the cacti of South America.

In 1942 the author began a series of collecting journeys in the course of which many unusual and some undescribed forms were found. The first lot of these is being published in the Argentine botanical journal "Lilloa" under the title "Cactaceas Nuevas de Bolivia" and includes descriptions of the following new species:

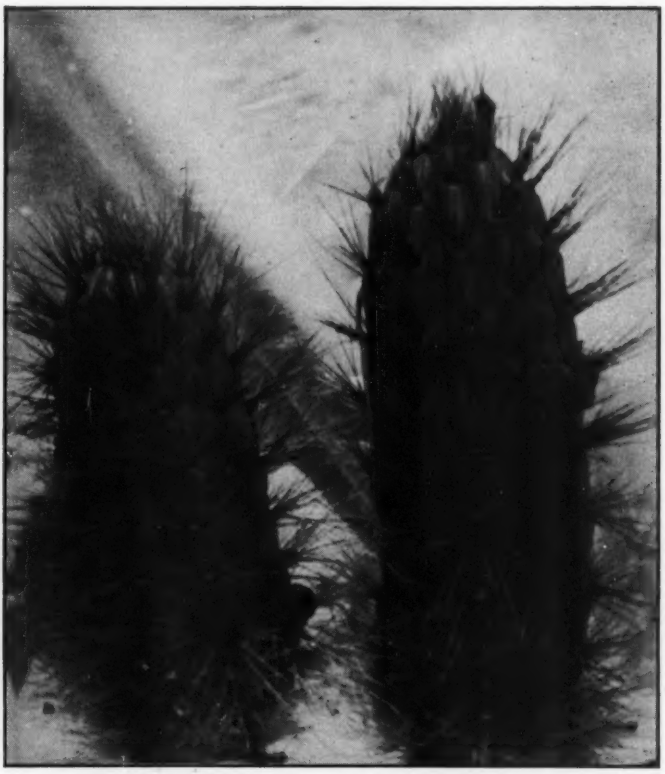


FIG. 38. *Castellanosia caineana* Cárdenas sp. nov. approx. x 0.5
Top joints with flower bud and bristles.

Pereskia diaz-romeroana, Opuntia (Pumilae) *tayapayensis, Opuntia* (Cylindropuntia) *chuquisacana, Opuntia* (Platyopuntia) *alko-tuna,* and *Opuntia* (Tephrocactus vel Cylindropuntia) *posnanskyana.*

CASTELLANOSIA, gen. nov.

Mesophanerophytae, cylindricae. Ramis heteromorphis e basim aculeatis et in regione superiore setosis. Costis rotundatis. Areolis superne cinereo vel brunei setae praeditis. Aculeis subulatis in areolis inferioribus praesens. Floribus campanulatis, tubo imbricato squamuloso axillis tomentosis, diurnis. Phyllis perigonii purpureo rubris; stylo crasso. Fructus globosus squamulosus. Semina parvissima.

Castellanosia caineana sp. nov.

Plantae cylindricae solum e base ramosae ad 6 m. altae. Ramis heteromorphis cum constrictionis 30-40 cm. distantibus. Costis 9 rotundatis, 13 mm. altis, 3.5 cm. latis. Areolis 3 cm. distantibus cinereo tomentosis, circularibus ca. 5-7 mm. diam.; areolis superioribus ex regione quartam constrictionem plus minusve 25 setae, 1-4 cm. long., alba vel cinereo vel brunei praeditis; areolis basalis 15-16 aculeis radiales, dissimilis 8-40 mm. long., 3-4 centrales 4-7 cm. long., praeditis; aculeis vetustiores longitudinem fissuratis. Floribus campanulatis 3-5 cm. long. Tubo imbricato squamuloso, axillis dense tomentosis. Phyllis perigoni oblongo-obtusis, interioribus acutis purpureo-rubris. Stamina numerosa; antheris longis applanatis, flavo temperatis. Stylo aliquid exserto crasso, roseo. Stigma 15 ramis, 1 cm. long., praedita. Floribus diurnis, Fructus globosus, 3 cm. long, 2.5 cm. diam., flavido viridis, superne residuis perigonii coronatus, imbricato squamulosus; pulpa mucoso viscoso. Semina 1 mm. long. castaneo nitentia. Vernacula "macororó."

Bolivia: in Provinci Tarata, Departamenti Cochabamba, prope Jatun Pampa, im dumosis fluvium Caine, 1,180 m. *Mártin Cárdenas* 4391, January, 1949 (Type in Cárdenas Herbarium, Cochabamba, Bolivia; co-type in U. S. National Herbarium). Provinci Cordillera, Departamenti Santa Cruz, prope Agua Caliente, 700 m. *Anibal Corro 4392,* March, 1949 (Card. Herb.). Provinci Florida, Departamenti Santa Cruz, prope Saipina, 1,600 m., July, 1949, *Anibal Corro* (no number) (Card. Herb.)

Cylindrical plants up to 6 meters tall, branched only at the base. Branches long, somewhat flexuose, heteromorphous, bearing spines below and bristles above, 8-11 cm. in diameter, slightly tapering, grayish-green. Areoles 3 cm. apart, circular, gray-felted. Areoles

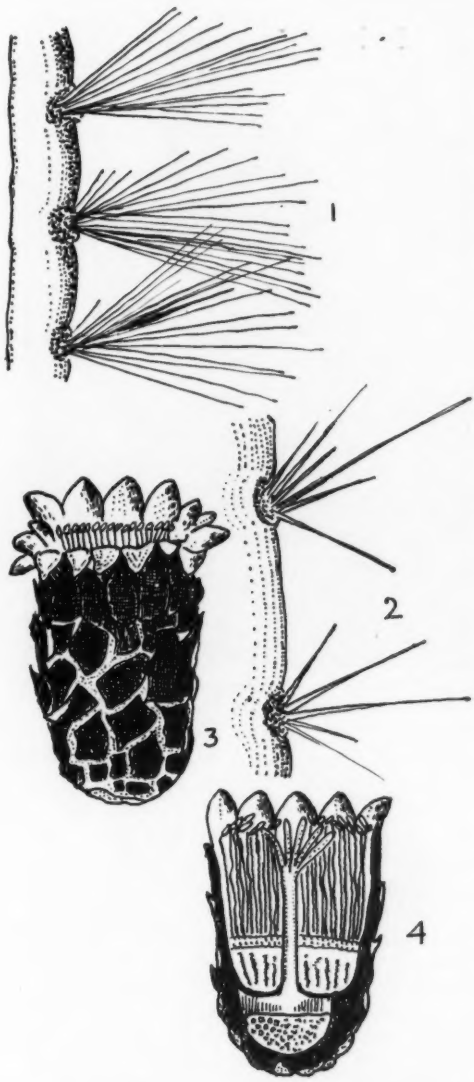


FIG. 39. *Castellanosia caineana* Cárdenas sp. nov. 1. upper bristle areoles; 2. lower spine areoles; 3-4. flower. All x 1.0

situated at the tip of the stem and above the fourth constriction bear only tufts of 25 or more flexible, whitish, gray, brownish or even blackish bristles. All the bristles are black at the base. They are of varied lengths, from 8 to 40 mm. The basal areoles, below the fourth or fifth constriction, bear 15-16 uneven radial spines, mostly subulate but with a few aciculate, bristle-like. Spines 8-40 mm. long, brown or gray-black. Central spines 3-4, swollen at base, 4-7 cm. Long spines, either radials or central, split lengthwise.

Flowers from the terminal four or five interconstrictions. Flower buds naked, arising from the center of the bristle-bearing areoles. Flower campanulate, 3-5 cm. long. Ovary and tube with broad, imbricate and abruptly acute scales which bear a dense white-cream felt in their axils. Outer perianth segments obtuse, inner ones, acute, purple-red. Anthers long, flattened, light yellow. Style somewhat exserted, thick, pink. Stigma rays 15, pinkish-white.

Fruit globose, 3 cm. long, 2.5 cm. broad, bearing at its rather tapering end the dry flower. Scales broad, imbricate provided with dense and short cream felt. Mature fruit green yellowish with dark yellow pulp which is mucous viscid, said to be poisonous. Seeds small, 1 mm. long, reddish brown.

The new genus *Castellanosia,* shows a remote relation with *Cephalocereus* of Pfeiffer, a group of cacti not yet clearly defined. It differs by the lack of either cephalium or pseudocephalium or even of hairs in the flowering areoles. The most striking character of this new genus is the heteromorphism of stem, with spined basal and bristled apical sections. The bristled apical portion seems to show a step toward specialization of branches to produce flowers, a condition fully developed in the true Cephalocerei from the Northern Hemisphere. The new genus is named after Dr. Alberto Castellanos, the Argentine cactologist.

BOLIVICEREUS, gen. nov.

Nanophanerophytum, cylindricus. Costis numerosis humilibus transverso sulcatis. Areolis rotundatis, prominentibus, bruneo tomentosis. Aculeis aciculares, tenuibus, radiantibus, Alabastri dense bruneo-rubris piloso. Flores rubris, diurnis, Cleistocactus revocantes. Fauce floribus lato oblique pleniter apertus. Fundo tubi lana praeditis. Stylo recurvato non exserto. Fructo globoso, parvo, densissime lanato, paulum succulento vel fere siccus e basim dehiscente. Semina parvissima, fulgens.

Bolivicereus samaipatanus, sp. nov.

Erectus columnaris a base exiguo ramosus usque ad 1.50 m. altus. Ramis 3.5-4 cm. diam. lactuce viridis. Costis 14-16 humilibus, 2 mm. altis, 7 mm. latis. transverso sulcatis. Areolis 3-4 mm. approximatis, rotundatis 2-3 mm. diam., prominentibus, tomento primum dimidio superiore bruneo temperato, inferiore cinereo, deinde atro-cinereo vel nigricans. Aculeis 13-22 tenuibus, inaequalis 4-30 mm. long., radiantibus, albido cinereis vel paleo-flavis vel bruneis. Alabastri denso pilis sericeis bruneo-rubrescentis velatus. Flores rubris, formae *Cleistocactus Baumannii* revocantes, 4 cm. long. Ovario globoso 7 mm. diam., squamis parvis rubris, denso albidis vel castaneis pilis praedito. Tubo aliquid applanatis, squamoso, sanguineus, apice roseo, pilosus. Fauce floribus 2 cm. lato oblique pleniter apertus. Phyllis perigoni exterioribus acutis 5-10 mm. long., purpureis rubriscentis; interioribus lineare acutis 15 mm. long., sanguineus. Stamina duplici

serialis alia fundo, alia fauci tubi inserta. Fundo tubi annulus lana praeditis. Antheris atro-purpureis. Stylo non-exserto, recurvato. Fructo globoso, parvo, 9-11 mm. long., 7-9 mm. lato, densissime albido et brunei lanato, flores siccus coronatus, paulum succulento e basim dehiscente. Semina parvissima, atro-brunei vel nigra, fulgens.

FIG. 40. *Bolivicereus samaipatanus* Cárdenas sp. nov. in its native home. x .12

Bolivia: in Provinci Florida, departamenti Santa Cruz, prope "El Fuerte" de Samaipata, 1890 m. *Anibal Corro 4395,* May, 1948 (Type, Cardenas Herbarium; cotype, U. S. National Herbarium). Same locality, *Anibal Corro,* May, 1949 (Card. Herb.)

Erect, branching from the base, up to 1.50 m. high. Branches 3.5-4 cm. in diameter, lettuce-green, terminated by a tuft of yellow or reddish spines. Ribs 14-16, low, blunt, about 2

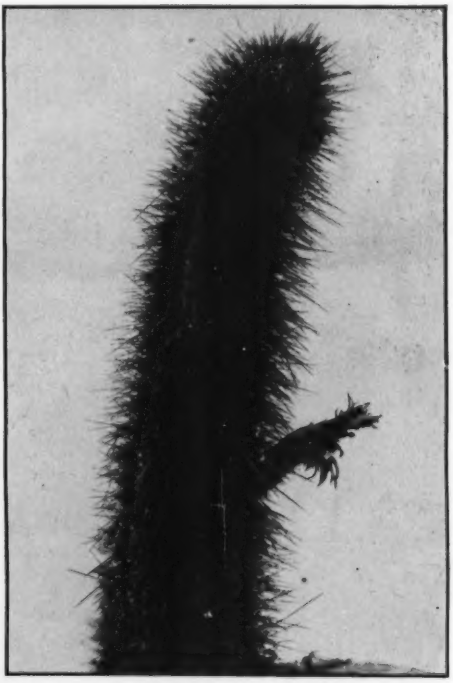


FIG. 41. *Bolivicereus samaipatanus* Cárdenas sp. nov. Top of stem with flower. x 0.5

mm. high, 7 mm. broad, slightly sulcate with transversal furrows. Areoles 3-4 mm. apart, 2-3 mm. diam., prominent and circular. Top areoles tan-felted, the ones below with light brown felt above and grayish below. Lowest areoles dark gray or black-felted. Some branches which are blunt-tipped bear areoles provided with black felt. Spines 13-22, not clearly differentiated into radials and centrals, though in some areoles there are 3-6 centrals. Length of spines uneven, shortest ones 4 mm. long, medium ones 1 cm. long, and the longest up to 3 cm. All spines finely acicular, spreading and slightly interlaced. Color whitish, gray, straw-yellow or brownish. Flower buds covered by dense light-brown or reddish-silky and shining hairs. Flowers from near the top of branches, not very numerous, bright red, 3.5 cm. long, zygomorphic, S-shaped as in *Cleistocactus Baumannii.* Ovary globose about 7 mm. diam. provided with small red scales which bear dense white and chestnut brown shaded hairs. Tube slightly flattened, blood-red, with 1-2 mm. long scales which are red, pinkish tipped, acute, and bear long wavy white, brown and blackish hairs. Flower completely open up to 2 cm. across. Outer perianth segments acute 5-10

mm. long, salmon red; inner ones, linear, acute about 15 mm. long, blood red. Stamens in two rows; the lower arising from the bottom of the tube and the upper ones from the flower faucis; base of lower stamens provided with a wool ring which surmounts the empty cavity above the ovary. Filaments light-purple-tinged; anthers deep purple. Style 27 mm. long, curved downwards, whitish below, orange above, not longer than the stamens. Stigma lobes hardly segmented, yellowish or greenish. Fruit globose 9-11 mm. long, 7-9 mm. broad, bearing the dry flower as a persistent part, with reddish acute scales and entirely covered by whitish or brown hairs. Flesh of fruit grayish and almost lacking in mature conditions; thus the fruit is dry and splits from below. Seeds 0.9 mm. long, dark brown or black, slightly granulate, shiny.

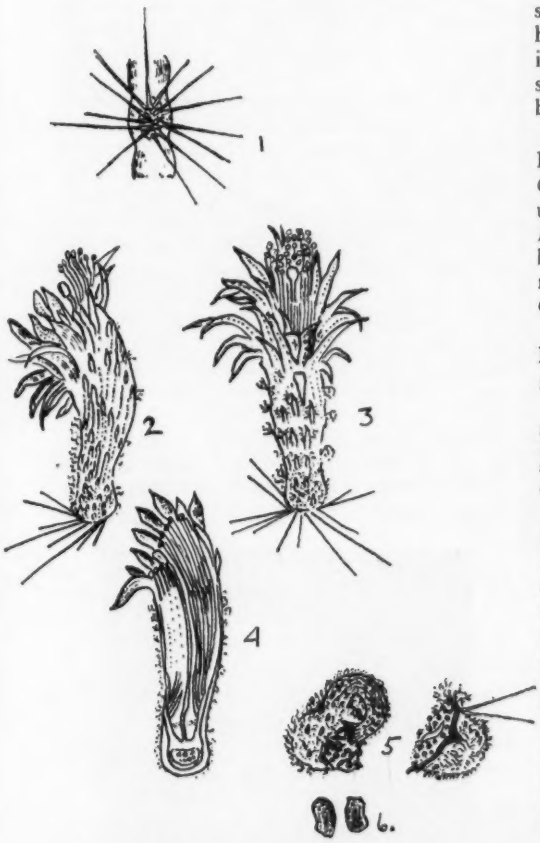


FIG. 42. *Bolivicereus samaipatanus* Cárdenas sp. nov. 1. areole, 2-4. flower. 5. fruit. All x 1.0. 6. Seeds x 5.0

The new genus *Bolivicereus,* belongs to the Loxanthocerei. By its general habit it suggests *Cleistocactus* but the entirely open flowers, unusual in this genus, recalls *Loxanthocereus, Borzicactus* or *Oreocereus.* The wool ring at the bottom of the tube suggests *Denmoza.* In some respects, then, the new genus is a link between *Cleistocactus* and *Loxanthocereus.*

Bolivicereus samaipatanus Cárdenas var. **multiflorus** var. nov.

Erectus vel prostratus, 50-70 cm. altus. Areolis 3-4 mm. approximatis. Aculei radiales 6-10, centrales 3. Flores numerosi, 5 cm. long, paulo S recurvati, rubri aurantiacus. Stylo 4-5 cm. long. fere stamina superanti. Stigmati 7, lutea, 1.5 cm. long.

Erect or prostrate, 50-70 cm. tall. Branches 3.5 cm. broad, fresh green, tapering. Ribs 13-14, low, 5 mm. high, 7 mm. wide. Areoles 3-4 mm. apart, 2 mm. diam., circular, dark brown felted. Radial spines 6-10, acicular, spreading, 4-6 mm. long; central spines about 3, longer than the radials. Young spines yellowish, old spines grayish. Flower buds from ribs near the top of stems, densely covered with silky white and brown-reddish hairs. Flowers zygomorphic, slightly bent in S-form, red-orange. Ovary globose, 7 mm. broad, 4 mm. high with acute yellowish scales bearing dense long-curled white and brown hairs. Flower fauces oblique, 3-5 cm. wide. Outer perianth segments lanceolate, 1 cm. long, 2.5 mm. wide, blood red; inner segments lanceolate, 1.5 cm. long, 4 mm. wide,

FIG. 43. *Bolivicereus samaipatanus* Cárdenas sp. nov. Flowers and fruit x 1.0

FIG. 44. *Bolivicereus samaipatanus* var. *multiflorus* var. nov. Cárdenas x 1.0. A joint with two flowers.

red with a magenta margin. Interior of flower tube white with a little wool at the bottom. Stamens in two rows; filaments white below, magenta at midlength and red above, very thin. Style about 4.5 cm. long, slightly exserted, whitish below, reddish above. Stigma rays about 7, thin, 1.5 mm. long, yellow.

Bolivia: Province of Florida, Department of Santa Cruz, at "La Angostura," *Martín Cárdenas 4395*, September, 1949 (Type in Cárdenas Herbarium, cotype in U. S. National Herbarium).

This variety differs from the type by its lower and sometimes prostrate habit and its larger number of flowers.

Rebutia arenacea[1] sp. nov.

Simplex saepe caespitosa subplana, vertice umbilicata, 2-3.5 cm. alta, 2.5-5 cm. lata, flavo viridis. Costae 30 spiralia disposita, in tubercula (3 mm. lata) dissolutae. Areolae oblongae densissime flavo-albi tomentosae, 2.5 mm. long. Aculei 14-16 tenuis, aciculari-setosis, pectinatis, adpressus plus minusve 5 mm. long. arenaces albo-flavi pubescenti. Flores 5-6 e latere vel basim corporis, 3 cm. long., 3 cm. lata, aureis, infundibuliformis; ovarium parvum e basim pilosum, ceterum nudus; tubus squamis paucis praeditus; phylla perigoni interiora 13 mm. longa acuta; stamina inaequilonga numerosa; filamentis aureoflavis; antheris pallide flavidis; stylo 1.5 cm. long. flavidi temperatis; 5 ramis stigmaticis albidus, 3 mm. long. coronatus.

Simple or caespitose, globose flattened deeply umbilicate, 2-3.5 cm. high, 2.5-5 cm. broad. Ribs about 30, spirally arranged and broken into 3 mm. broad tubercles. Areoles 3 mm. apart, obliquely transverse in relation to the direction of the ribs, elliptic, 2.5 mm. long, with gray-creamy silky dense felt. Spines all radial, pectinate, 6-7 on each side of the areole plus one on each apex; all spines bristle-like, about 5 mm. long, appressed, interlaced and covered by short silky cream-colored hairs. Flowers 5-6 from the base or the equatorial section of heads, funnel-form, 3 cm. long and 3 cm. wide when open. Ovary hairy at its base only, naked above, with broad, somewhat orbicular and abruptly mucronate, imbricate red-brown scales. Tube short, about 3 mm. long, 4 mm. wide, slightly bent. Outer perianth segments scale-like, few, spatulate, mucronate, 7 mm. long, 3 mm. broad, brownish, with red tips, light-green margins; upper outer segments longer, about 1.5 cm., spatulate or lanceolate, golden-yellow with brownish tips; inner segments 3 mm. long, acute, somewhat striate, yellow-orange. Stamens from the base of the tube to the base of the petals; filaments golden-yellow, anthers light

FIG. 45. *Rebutia arenacea* Cárdenas sp. nov. x 1.0

yellow. Style 1.5 cm. long, light yellow, longer than the stamens. Stigma rays 5, whitish, 3 mm. long.

Bolivia: Department of Cochabamba, Province of Ayopaya, near Tiquirpaya, about 10 to 15 kilometers towards Santa Rosa, alt. 2,200 m., *E. Rocha* June, 1949 (type in Cárdenas Her-

[1]The name *arenacea*, which means sandy, refers to the appearance of the spines, which look as if covered by loose sand.

FIG. 46. *Rebutia arenacea* Cárdenas sp. nov. showing cross section of flower. x 1.0

barium, cotype in U. S. National Herbarium).

This new species is related to *Rebutia Krainziana* Kesslrg. but differs by its more numerous spines and the smaller golden-yellow flowers.

Rebutia glomeriseta sp. nov.

Caespitosa, globosa paulo subumbilicata, pallide viridis, 5-6 cm. diam. Costae 20, in tubercula 5 mm. diam. dissolutae. Areolae 4 mm. distantes, 2 mm. diam. primum pallide bruneis vel albidus deinde atro cinereis tomentosae. Aculei setosis, numerosis, glomerantes, 2-3 cm. longis, albis. Flores singulares e latere basim corporis, 2.5 cm. longi, aureis. Ovarium 4 mm. diam. pallide flavis, nudum, squamis latis lilacinum praeditus; tubus 3-4 mm. long. cum squamis, ceterum nudus. Phylla perigoni interiora oblonga linearis 7 mm. long. Stamina numerosa, filamentis albis, antheris flavis. Stylo 11 mm. long. albis; stigma 4-ramis pallide flavidis.

Caespitose, globose, about 5-6 cm. diameter. Ribs about 20, spirally arranged and broken into round 5 mm. tubercles. Areoles 4 mm. apart, about 2 mm. diam.; young areoles light brown or whitish felted, prominent, circular; old areoles dull gray felted. Spines bristle-like, numerous, 2.3 cm. long, white, rather appressed, interlaced and hiding the light green and umbilicate stems; top bristles shorter, reddish brown; all bristles thin, thread like, flexible. Flowers single, from the lower and lateral portions of stems, 2.5 cm. long, golden yellow. Ovary 4 mm. diam., light yellow, with broad lilac margined scales. Tube short 3-4 mm. long, bearing few scales, without hairs. Outer perianth segments 6 mm. long, 1.5 mm. broad, mucronate, yellow, lilac tinged. Inner segments 7 mm. long, 2 mm. broad, yellow. Stamens in two rows; filaments white, anthers yellow. Style about 11 mm. long, white. Stigma lobes 4, light yellow, 3 mm. long.

Bolivia: Department of Cochabamba, Province of Ayopaya, near Naranjito, Hacienda Choro, on the way to Rio Cotacajes, 1,800 m. *E. Rocha 4399* April, 1949 (Type, in Cárdenas Herbarium, cotype in U. S. National Herbarium).

This species from the northern area of the genus Rebutia appears to be completely distinct from any of the Bolivian species.

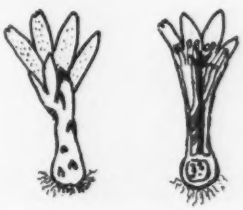


FIG. 48. *Rebutia glomeriseta* Cárdenas sp. nov. Showing cross section of flower. x 1.0

Parodia columnaris sp. nov.

Caespitosus, brevi columnaribus fere clavatus, 7-30 cm. altus, 3-7 cm. crassis, temperato viridibus. Costae 12-13, rectae, ca. 5 mm. altae, basi 8-14 mm. latae, depresiones transversales praeditae. Areolae 8 mm. remotae, subcirculares, 2.5 mm. diam. primum albo

FIG. 47. *Rebutia glomeriseta* Cárdenas sp. nov. x 1.0

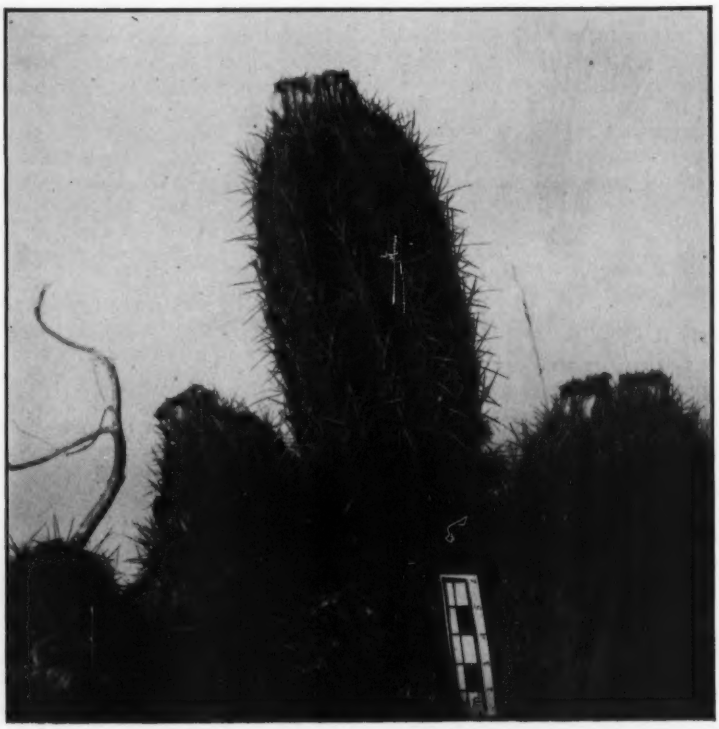


FIG. 49. *Parodia columnaris* Cárdenas sp. nov.

deinde atro cinereo tomentosae. Aculei radiales 7-8, adpressi, aciculares pungentes, cinereis 1-1.8 cm. long., paulo recurvati. Aculeus centralis 1, cinereus, 1-2 cm. long. deorsum deflectus. Flores 8-10 a vertex caulis lanati, campanulati infundibuliformes 2.2 cm. long., 1 cm. lati. Ovarium 4 mm. diam. Tubus luteus, squamosus, lanatus, setosus. Phylla perigoni 12 mm. long., spathulata, flava. Stamina a basim ad summum tubus disposita; filamenta antheraeque flavo albida. Stylus 15 mm. long., flavus, stamina superantis. Stigmata 7-8 flava, 2 mm. long. Fructus fere siccus, globosus, 4 mm. diam., rugosis, tomento albo in minutulus tuberis praeditis. Semina atro brunea nitentia, ovata ca. 0.3 mm. diam.

Forming clumps 30 cm. high and 25 cm. broad. Stems clavate-cylindric, leaf green, 7-30 cm. high, 3-7 cm. in diameter. Ribs 12-13, fairly straight, low, 5 mm. tall, 8-14 mm. broad. Areoles about 8 mm. apart, suborbicular, 2.5 mm. diam., whitish felted while young, then dark gray felted. Radial spines 7-8, being disposed 3 above, 3 below and 1-2 laterally on each areole, appressed, slightly curved, gray, 1-1.8 cm. long. Central spine 1, slightly curved downwards, 1-2 cm. long, gray. All spines bristle-like but stiff. Flowers from the top of the stems, 8-10 in number, emerging only from the tip, from a wool cephalium-like cushion, 1.5-2 cm. high, 2-3 cm. diam. Each flower is almost entirely covered by a dense wool which is white below and reddish-brown above. Flower campanulate or urceolate, 2.2 cm. long, 3-10 mm. diam. Ovary 4 mm. diam. Tube urceolate, yellow, scaly, somewhat constricted above the ovary, provided with brown bristles and hairs. Perianth segments light yellow, spatulate, about 12 mm. long. Stamens numerous inserted from the base of the tube up to the base of the petals; filaments and anthers light yellow. Style about 15 mm. long, surpassing the stamens but not exserted from the tube; stigma rays 7-8, light yellow, 2 mm. long. Fruit almost dry, 4 mm. diam., rugose, covered with minute tubercles which bear white hairs. Seeds very small, black, shiny.

Bolivia: Department of Cochabamba, Province of Campero, "Angosto de Perez," on the way down from Perez to Puente Taperas, 1600 m., August, 1949, *Cardenas 4396* (Type in Cardenas Herbarium, cotype in U. S. National Herbarium).

This new species is readily distinguished by its tubular or urceolate flowers and its columnar habit.

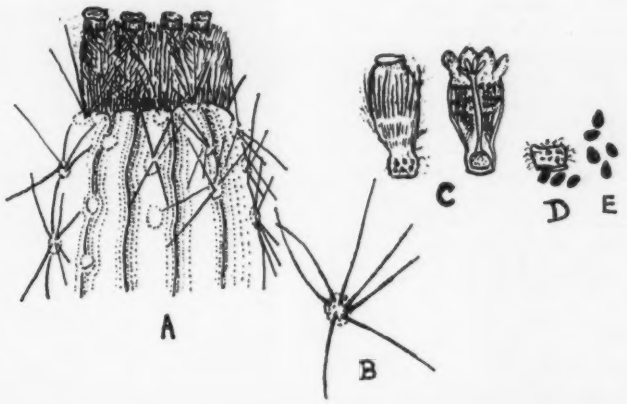


FIG. 50. *Parodia columnaris* Cárdenas sp. nov. A top of stem x 1.0; B. areole x 1.5; C. flower x 1.0; D. fruit x 1.0; E. seeds approx. x 10.0

Parodia tuberculata sp. nov.

Caulis late globosus non prolifer, 5-7 cm. latus, 4-5 cm. altus, griseo virides, vertex paulo impressus pauci lana obtecta. Costae ca. 13, spiralae in sphaeroidatae 1 cm. diam. mamillas solutae. Areolae cinereo tomentosa, 12 mm. remotae, circulares, 3 mm. diam. Aculei radiales 10-11, aciculares, 7-10 mm. long. quoquoversus fere adpressus. Aculei centrales 4, 13-18 mm. long. unus deorsum deflectus, uncinatus. Omni aculei cinereis, albo pruinati a basim incrassati. Flores brevi campanulati, 18 mm. long., aurei rubris. Ovarium albo-lanatum, 4 mm. diam. Tubus parvus, superne dilatatus, minutulus squamis pilosus praeditis. Phylla perigonii exteriora interioraeque lanceolata. Stamina fere incrassata. Stylus 1 cm. long., flavus stamina superantis. Stigmata 7, flavida. Fructus globosi, 5-7 mm. diam., paulo umbilicati, superne atropurpureus, infere temperatus, pauci pilosus. Semina 0.8 mm. diam. nigra opaca.

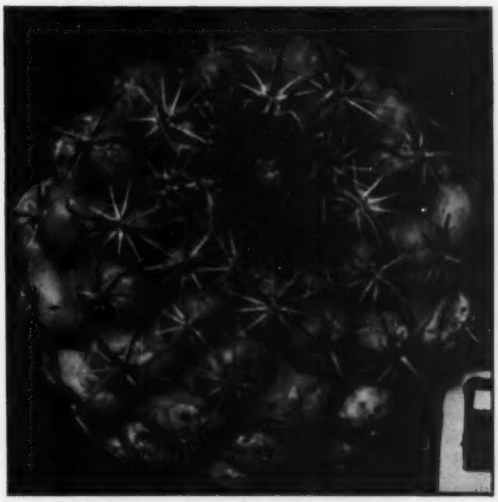


FIG. 51. *Parodia tuberculata* Cárdenas sp. nov. x 1.0

Bolivia: Province Oropeza, Departmento Chuquisaca, near quebrada de Villa Maria on Hacienda Ressini, about 5 km. beyond the Sucre Air Port, 2700 m., February, 1949, *Martin Cardenas 4397* (Type in Cardenas Herbarium, cotype in U. S. National Herbarium).

Simple, globose, 4-5 cm. high, 5-7 cm. broad, grayish green. Ribs about 13, spirally arranged, hardly visible on account of the spheroidal 1 cm. diameter tubercules. Areoles 12 mm. apart, circular, 3 mm. diameter, gray-felted. Top of stem depressed, about 2 cm. diameter, with white wool and tight areoles bearing little brownish tangled spines curved outwards. Radial spines 10-11, acicular, spreading outwards, somewhat appressed, 7-10 mm. long. Central spines 4, 13-18 mm. long, one of them turned downwards and slightly hooked. All spines grayish, finely pruinate, slightly swollen at base. Flowers several from the top of stem, red-orange, shortly campanulate or urceolate, 18 mm. long. Ovary light yellow, 4 mm. diameter, covered by dense white hairs. Tube short, widening above, bearing short scales with hairs. Outer perianth segments orange-red, lanceolate; inner ones lanceolate with roundish apex. Sta-

FIG. 52. *Parodia tuberculata* Cárdenas sp. nov. 1. flower x 1.2; 2. fruit x 1.0; 3. seeds x 6.0

mens rather thick, filaments light orange, anthers lemon yellow. Style yellow, 1 cm. long, exceeding the stamens in length. Stigma rays 7, orange-yellow. Fruits about 6 mm. in diam., globose, naked or provided with minute tubercules bearing white hairs. Fruit dark purple above, lighter below. Seeds about 0.8 mm. diameter, black, not glossy, very finely granulate.

This species remotely resembles *P. carminata* Bckbg. from Salta, northern Argentina, but differs in having larger tubercules, appressed radial spines and smaller flowers.

Parodia ayopayana sp. nov.

Caulis globosus raro caespitosus, 6-8 cm. altus, 6-9 cm. latus, laete virides. Costae ca. 11 aliquid acutae et tuberculatae, 2 cm. altae, basi 2 cm. latae. Areolae 12 mm. inter se distantes, ellipticae vel orbiculares, 9 mm. diam. primum albe deinde cinerei tomentosae. Aculei radiales 10-11 horizontaliter adpressi, aciculares fere pectinatae 1.2-2 cm. long., albescentes. Aculei centrales 4 radiantes, subulatae, temperato, bruneis vel albescentes a basim incrassati, 3-3.5 cm. long. Flores 3 aut pluris ex apice lanati caulis, 3 cm. long. Ovarium globosum, 6 mm. diam. temperato flavum, squamis minutulus instructum. Tubus campanulato-infundibuliformis, aureis, squamis 5 mm. long., flavis, apice bruneo in axillis lanam albidam praeditus. Phylla perigonii interiora lanceolata, aurea. Stamina ex fundus usque dimidia tubus disposita. Filamenta aurea. Antherae flavida temperatae. Stylus 21 mm. long. aliquid stamina superantes, aureus, superne striatus. Stigmata 11 ramis, 3 mm. long., aureis praedita. Fructus 1-4 cm. long. (in specimena a me viso), superne tubulosus et cavus, rubrus, copiosa lana alba obtectus. Semina atro-brunescentia globosa subtiliter granosa, 0.6 mm. diam., hilo semigloboso.

Bolivia, Department of Cochabamba, Province of Ayopaya, Puente Pilatos, on way from Morachata to Independencia, 2,700 m., October, 1949, *Martin Cardenas 4398* (Type in Cardenas Herbarium; cotype in U. S. National Herbarium).

Simple, rarely caespitose, globose, 6-8 cm. high, 6-9 cm. broad, fresh green. Ribs 11, rather acute, slightly tuberculate, 2 cm. high and 2 cm. wide at their base. Areoles 12 mm. apart, 9 mm. diameter, ellipsoid or circular; upper ones densely white-felted, lower ones gray-felted. Radial spines 10-11, horizontally appressed, acicular (somewhat pectinate in the large elliptic areoles), whitish, about 1.2-2 cm. long. Central spines 4, spreading, subulate, light brown or whitish, swollen at their bases. Upper central spine 3-3.5 cm. long directed towards the top of stem, the remainder 3 centrals spreading, 3 cm. long. Flowers 3 or more from the slightly depressed top of stem covered by a dense white wool cushion. Each flower about 3 cm. long, with orange wool on the ovary and white wool on the upper section. Ovary light yellow, 6 mm. diam., with traces of minute

FIG. 53. *Parodia ayopayana* Cárdenas sp. nov. x 1.0

tubercules. Flower tube constricted above the ovary, golden yellow, with scales about 5 mm. long, yellow, brownish, acute tipped, and bearing white hairs in their axils. Stamens inserted from the bottom of the tube to the midlength of the tube. Filaments golden yellow, anthers light yellow. Style about 21 mm. long, slightly longer than stamens, striate on its upper two thirds. Stigma lobes 11, about 3 mm. long, golden yellow. Fruits 1-4 cm. long (on the specimens I have examined), not juicy, hollow above, reddish, bearing the remains of the dry flower, almost entirely covered by white hairs. Seeds black or brownish, globose, 0.6 mm. diameter, finely granulate; hilum covered by a large aerenchymatic cushion.

This new species is distinguished by the long tubular red fruits. Puente Pilatos, the type locality, is the most northerly station for the genus *Parodia* in Bolivia, 17° South latitude.

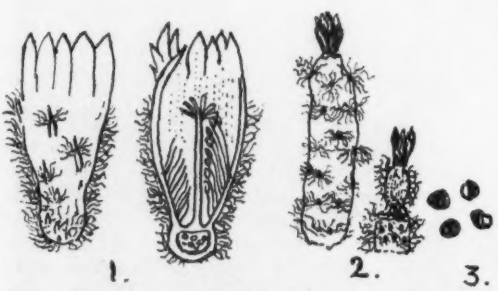


FIG. 54. *Parodia ayopayana* Cárdenas sp. nov. 1. flower x 1.0; 2. two fruits from the same plant x 1.0; 3. seeds x 7.0

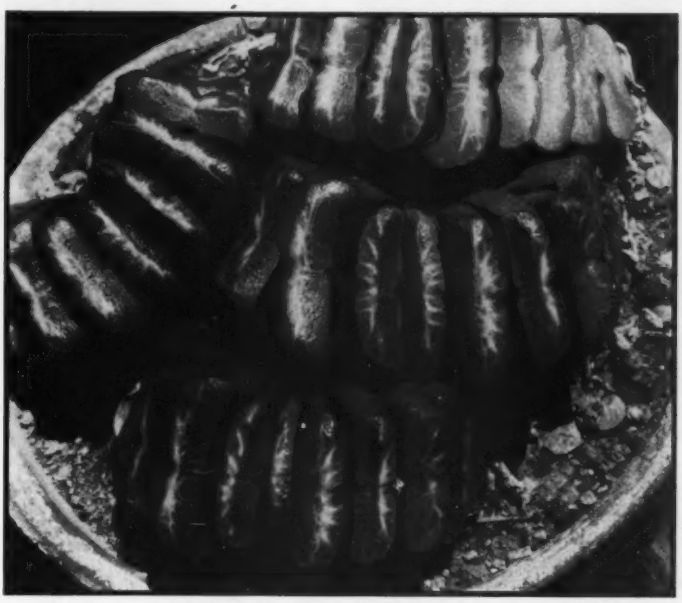


FIG. 55. *Haworthia truncata* Schönland, nat size. Photo by author.

STUDIES IN THE GENUS HAWORTHIA Duval

1. Vegetative Variation in the Section *Fenestratae* Poellnitz*

By P. C. HUTCHISON

Most of the sections of the genus Haworthia Duval have been established on vegetative characters alone. Only recently Uitewaal (11) proposed a subdivision of the genus based on floral characters, and Smith (10) erected the section *Limifoliae* on both floral and vegetative characters.

The tendency to base systematic work in this genus on vegetative characters reached its climax in the papers of Dr. Karl von Poellnitz, who in many cases did not wait for flowers on imported living material before describing new species and varieties and assigning them to sections. Subsequently a great range of variation in vegetative characters became apparent and von Poellnitz and others attempted to incorporate these variants into the existing subdivisions of the genus, with an apparently inexhaustible supply of specific, varietal and form names. Over four hundred legitimate names are now extant for this genus and ten to twenty or more new names appear each year. It seems fairly obvious that eventually each clone of Haworthia could have a name if vegetative characters are to remain the only diagnostic ones.

The purpose of this note is to examine the nature and variation of vegetative characters in the section *Fenestratae* Poellnitz. The sections *Retusae* Haworth and *Fenestratae* Poellnitz appear to be very closely related, indeed, using only "vegetative characters," the distinctions between them are minute. In a subsequent paper the morphology of the flower and its variation will be discussed in terms of the systematic significance of floral characters for a separation of these two sections.

The section *Fenestratae* was erected by Poellnitz (5) for the aberrant *Haworthia truncata* Schönland, the only species with bifariously ar-

*University of California Botanical Garden (Berkeley) Contribution No. 121.

ranged leaves, and for *Haworthia Maughani* Poellnitz, which was included because of its similarly upright and abruptly truncate leaves. The leaves of the latter species are, however, spirally arranged. Both species have contractile roots capable of drawing the plant down into the soil until only the tips of the leaves are visible. The succulent leaves are translucent to semi-translucent at the truncated apex and little or no chlorophyll occurs in apical cells or in water-storing tissue of the center of the leaf. Schönland (8) reports that very little light can enter the leaf except through the upper flat portion, whence it is transmitted to the parenchymatous assimilating tissue lining the epidermis. This "window" in the leaf bears few to many small tubercles and/or more or less prominent greenish-white to brownish-pink pigmentation. Either character occasionally may be absent, although in no case were plants observed which were free of both tubercles and pigmentation.

Variation in the thickness of the truncated leaf apex of *H. truncata* was noted by Poellnitz (6) who designated three of these variants with form names: forma *tenuis* Poelln., with leaf apex 3 to 4 mm. thick, from near Oudtshoorn; forma *normalis* Poelln., with apex 6 to 8 mm. thick, from near Oudtshoorn and Ladismith, and forma *crassa* Poelln. with apex 9 to 11 mm. thick, from near Calitzdorp. Poellnitz remarks that so far as he knows these three forms do not grade into one another. No reports are available concerning the thickness of the leaf apex in natural populations and few of the several hundred cultivated specimens examined in California were annotated with habitat data. However, every degree of intermediacy was found between the extremes noted by Poellnitz which suggests that the thickness of the leaf apex has little systematic value.

Poellnitz (6) mentions that a larger-leaved form of *H. Maughani* had come to his attention, but he could not decide whether it was worthy of taxonomic rank. Although few specimens of this species are in cultivation here, those that have been observed—either as newly imported or long-cultivated plants—show leaf-size variations similar to those of *H. truncata.*

The leaf apices of both species are covered with minute, concolorous tubercles. In *H. Maughani* there seems to be little variation in their density or size, while the opposite is true of *H. truncata.* The plant illustrated in figure 57 has the largest tubercles seen, but size and density vary from leaf to leaf. Tubercles vary in size, density and arrangement on the leaves in most species of Haworthia. This character has been discussed in some detail by O'Donoghue (2), Smith (9), and Resende (7) for other sections of the genus.

Pigmentation at the leaf apex is usually present in *H. truncata* as an irregular ramifying band across the window, varying in prominence, elaboration and coloring. Color appears to depend on environmental conditions. During periods of normal respiration and growth, the markings are green to white; during dormant periods the coloring may become brownish-pink. In some plants these markings may become very pronounced (figure 55) and it is this degree of

FIG. 56. *Haworthia truncata* Schönland, nat. size. Photo by author.

marking which has been noted on all plants of *H. truncata* which were erroneously labeled "H. magnifica." This latter epithet has been applied horticulturally as a specific or subspecific designation for these well-marked forms. *Haworthia magnifica* Poellnitz is an entirely different species (4) in the section *Retusae* Haworth, and does not appear to be in cultivation.

Pigmentation in *H. Maughani* appears to be restricted to more or less regular lines radiating from the edge of the leaf apex toward the center. These lines seldom converge or ramify and rarely acquire the pink color which is common in certain stages of growth in *H. truncata.*

The bifarious leaf arrangement of *H. truncata* was considered by Schönland (8) to be a completely definitive character. Figure 57 represents a plant of this affinity in the Irving collection, collected in the Calitzdorp area by Mr. T. J. C. Kleyn of Capetown. The leaves are arranged in an irregular spiral. This plant is the more remarkable for the variant leaf types it bears. Two of the leaves are of the *H. Maughani* type, five are of the *H. truncata* type, and one appears to be intermediate, with a somewhat cordate apex. These species hybridize readily in cultivation and it is entirely possible that in the Calitzdorp area, where both species are known to occur, intermediate forms will be found. This plant appears to give evidence that some introgression between these two species may have occurred.

Schönland (8) notes that the median channels on both sides of the leaves of *H. truncata* probably function to facilitate an interchange of gases with the atmosphere. The leaves in this species are tightly compressed against one another, and this, together with its bifarious leaf arrangement, the hypogean habit of the plant, and the position of the stomata on the lower half of the leaf, would make gaseous interchange difficult were there not some passage to the air above ground. These channels may occasionally be absent from one or both sides of a leaf in some plants, or may be very obscure. In *H. Maughani* there is no similar channeling of the leaves. This species, however, has a greater surface area exposed for gaseous interchange, for the older leaves are never as tightly compressed as in *H. truncata* and are spirally arranged.

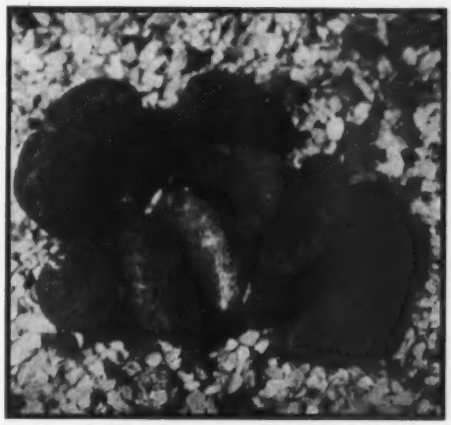


FIG. 57. *Haworthia truncata* Schönland x 1.2

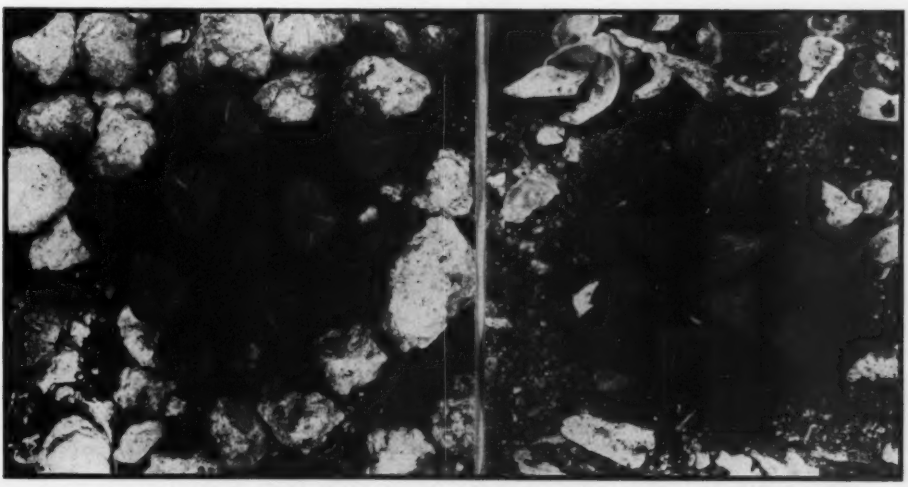


FIG. 58. (Left): *Haworthia Maughani* Poellnitz. FIG. 59. (Right): *Haworthia* sp. section *Retusae* Haworth. Both nat. size. Photos by author.

Neither species seems to offset readily, which accounts in large part for their rarity in cultivation. Clusters of *H. truncata* are occasionally seen but there is no record of collections in natural habitats of other than solitary plants. Under ideal horticultural conditions mature plants of *N. truncata* will cluster in four or five years. Figure 55 represents a plant in the collection of Dr. Meredith Morgan of Richmond, California, which was imported as a cluster from W. Triebner of Windhoek over 10 years ago.

There is no record of clustering in *H. Maughani*. Mr. A. Irving of Alameda, California, reports that this species occasionally can be propagated from root cuttings and that several offsets will form on a single root if properly treated. Individual leaves of either species will root readily in clean sand and quite often several offsets will form on a single leaf. These can be removed and grown separately and the leaf will frequently form more offsets. In this way as many as twelve offsets have been grown from a single leaf, but it may take as long as 3 to 4 years for these offsets to assume mature size. If offsets grown in this way were allowed to remain attached to the leaf they would at maturity give the impression of a natural cluster. Likewise injury to a plant might cause it to form new meristems. But under habitat conditions the clustering habit seems to be exceptional for *H. truncata* and to occur rarely or not at all with *H. Maughani*.

Fasciation is not recorded in this genus. There is a teratological variant of *H. truncata* in the Morgan collection (figure 56), also imported from Triebner, in which the leaves are twisted and curled in an irregularly convolute pattern so typical of many cristates. Occasionally the plant bears an offset which is a reversion to the typical form, as can be seen in the figure, but usually its new growth is the same.

The forgoing evidence indicates that in leaf characters there is little to distinguish section *Fenestratae* from section *Retusae*. Many species of the *Retusae* have contractile roots and partially hypogean habit, similarly (though less severely) truncated leaves, apical leaf "windows" with pigmentation and tubercles, and comparable internal morphology (1). However, it should be pointed out that the extremely truncated leaf apices of the *Fenestratae*, the reduction of transpiration by bifarious leaf arrangement in *H. truncata* and concurrent channeling of the leaves of this species for gas interchange, and the tendency toward cylindrical leaves in *H. Maughani* appear to indicate a much higher degree of specialization in section *Fenestratae*. These two species appear to be extremes derived from the section *Retusae*, however, the evidence of vegetative morphology seems insufficient to warrant sectional rank for them.

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C. M. Fitzpatrick of Edinburg, Texas, Howard Gates of Corona, California, and Dr. G. L. Berry of Oklahoma, were featured in the *Saturday Post* of April 7. It was unfortunate that most of the article was negative in its discussion of the cactus as a pest. Contrast this article with one on Cacti and Succulents by Ernest Chabot in the *Popular Gardening Magazine*: this interview with Vincent Mason, Newtonville, Massachusetts, is packed full of information that would encourage any reader to try growing a few plants.

	Postpaid U.S.A.	*Foreign*
Aloes of South Africa—Reynolds... (Shipments are now being made from South Africa, allow 6 wks.)	$14.50	$15.00
Arizona Cacti—Benson..... (Now available)	4.00	4.20
Morphology of Cacti—Buxbaum... (Now available)	2.75	2.90

NEW BOOK ON MESEMBS

"Notes on Mesembryanthemum and Allied Genera" by H. M. L. Bolus, Cape Town, August, 1950. This Part III includes pages 189 to 236 inc. This book deals with the mimicry Mesembs. or "Living Stones" and includes 7 pages of colored plates showing 48 species of *Conophytum*. Numerous new species and combinations are included, also drawings and black and white photos. A few copies are available at $4.50 postpaid from Abbey Garden Press, 132 W. Union Street, Pasadena 1, California.

SPINE CHATS

LADISLAUS CUTAK

In the death of William A. Pirtle the cactus world lost a staunch supporter. Bill passed away suddenly at Grandview Hospital and was buried in Hillcrest Memorial Park on March 1, 1951. A resident of Edinburg, Texas, since 1928, he was co-owner of Pirtle Cactus Gardens, located on Morningside Road, east of town. This thriving cactus establishment, spread out over three acres, was one of the show places of the Lower Rio Grande Valley for the past twenty years. Tall, living, impenetrable cactus fences were a feature of the Garden from which hundreds of branches were cut off to supply the trade. Innumerable South American Gymnocalyciums, Lobivias and Rebuties grew in long rows like cabbages, their bushy heads grafted on Lemaireocereus stocks. Hedges of Bunny Ear Opuntia and Golden Balls glistened in the Texas sun. Barrels, Sea Urchins, and Bishop Caps in all sizes dotted the open fields, for these were specialties for which Pirtles were famous for. The Pirtles—father, mother and two bachelor sons—came to Texas from Kentucky in 1909. The cactus garden started as a hobby in 1930 but it grew so fast it became a professional enterprise. The Garden was opened to the public and featured in national magazines. My first visit to the Garden was made in 1938 at which time I lingered several days—jotting down notes and photographing all the outstanding novelties until my supply of film was exhausted. During that time I lived with the Pirtles and got to know them real well. Many of the cacti in Shaw's Garden have originated from them. Bill Pirtle was a veteran of World War I and more or less in poor health since those days; however, he managed to take care of all the correspondence and business while brother Paul took care of the production. In the past few years frosts played havoc with the outside collections and the most severe one occurred last winter, which I believe, contributed to Bill's sudden death. The brothers tried frantically to save as many of the valuable outdoor specimens as they could and the exhausting work, no doubt, sapped Bill's strength, necessitating removal to the hospital where he passed away on February 27th. Paul Pirtle will continue the business selling both wholesale and retail by mail only.

* * *

A second sad death to report is that of Dr. Clara H. Clevenger on March 25th at Kirksville, Mo. She was an outstanding sociologist, economist and educator who taught for the past 30 years in the Northeast Missouri State Teachers College. Those of you, who had attended the cactus convention in St. Louis, will remember her and her husband, Dr. Lewis Clevenger, also a member of the College faculty. Mrs. Clara Clevenger, despite her teaching duties, found time to develop several hobbies, such as art needlework and the culture and arrangement of flowers. She was a true cactophile, collecting cacti and succulents which she grew in windows of their spacious home on East Patterson Ave. She seemed to favor the Haworthias, Gasterias and Echeverias because of their small size and pleasing colors; but she also grew a number of Mammillarias and other miniature cacti. Her interest in succulents began in 1937 because she had found that her original love—bulbous plants—were ugly and ungainly except for the one week of glorious bloom they offered. Mrs. Clevenger was a member and one of the organizers of the Kirksville Floriculture Club and belonged to a number of other school and civic organizations. She worked freely with college students and won their respect and admiration as an advisor and friend.

* * *

A third prominent death was that of Prof. Casiano Conzatti in Oaxaca, Oax., Mexico, who was in his 89th year. This eminent taxonomist, whom I had the pleasure of meeting in 1947 and for whom a number of cacti are named, will be the subject of a future article in this JOURNAL.

* * *

Five new species of Ceropegia were described by E. A. Bruce and P. R. O. Bally in Kew Bulletin (No. 3, 1950). The first, *C. brosima,* is said to be a little climber with pale greenish-white flowers and flat compressed tubers which are edible and eaten raw by the natives. The second, *C. copleyae,* has unusual leaves which look like some species of Mesembryanthemum. The third, *C. evelynae,* is an attractive fleshy climber with its dark shiny green leaves and large flowers, closely allied to *C. succulenta.* The fourth, *C. helicoides,* is also allied to the preceding, possessing large elongate flowers with pale green to white, finely maroon-dotted lobes and spirally twisted tips. The fifth, *C. imbricata,* has rather closely set, overlapping dark green leaves and greenish-white flowers with maroon tips. All, except *C. evelynae,* are native to Kenya Colony in Tropical Africa, while the latter was found scrambling in undergrowth at the edge of Crater Lake in adjoining Uganda.

* * *

I wish all of you could attend the cactus convention in Denver during the week of July 9th. Denver offers a salubrious climate, is located in a highly scenic region, and the cactus people there are very congenial. The program promises to be most satisfying, both from an educational and recreational standpoint. A number of good speakers and beautiful kodachromes have been lined up. The ladies are asked to bring along a succulent-decorated hat to vie for a number of attractive prizes. You are not limited to one hat—bring along as many as you want. They can be artistic, fashionable, or as ludicrous as Carmen Miranda would wear. This stunt might make people more cactus-minded. Why not cooperate and make a success of it? If you have any ideas on how we can improve our fun session or the initiation ceremony, won't you please write me? You know two heads are better than one. This is your convention. Try to be with us and make it the biggest ever!

* * *

Just as we were going to press we learned of the death of Alain White of Summerville, South Carolina.

* * *

We offer a single copy of H. Jacobsen's "Verzeichis der Arten der Gattung Mesembryanthemum" as it appeared in Fedde's Repertorium in 1938. This book contains the most valuable list of genera and species of Mesembryanthemums with their synonyms. Price $25.00 (no covers). Box 101, Pasadena, Calif.

BOOK REVIEW

MESEMBRYANTHEMACEAE by H. Jacobsen, Dr. O. H. Volk, and H. Herre; 128 pp., 32 ill.; published by Eugen Ulmer, Stuttgart (Germany), 1950; DM 5.80. (Abbey Garden Press. $1.50 postpaid.)

The title of this much-needed booklet requires explanation. Until recently the "mesembs" were contained in the *Aizoaceae,* but it was felt by such authorities as Schwantes, Nel, Herre and others that these plants are sufficiently distinct to form their own family, the *Mesembryanthemaceae;* from the *Aizoaceae*—in which remain such horticulturally uninteresting genera as *Tetragonia* and *Aizoon*—it mainly differs in having hygroscopic seed-capsules and numerous petals. The first publication of this family was being planned by Herre and Volk, but it seems that this had taken place as early as 1868, by Lowe in "Flora Madeira."

Written in German, this new work is naturally of limited usefulness to Americans. But every serious collector is urged to acquire a copy, not only for its excellent drawings and photographs, but, most important, for its complete 45-page list of all the species and synonyms so far referred to this popular group, a list for which we have been waiting for many years.

The booklet is more or less divided into three sections. First a general summary, Professor Volk of the University of Würzburg handling the botanical subjects, Mr. Jacobsen doing those on cultivation, and the chapters cover such things as morphology, ecology, distribution, soil analysis, cultivation, flower and fruit construction. Most of this had been done before, but never in so compact and readable a form.

The next section is of great value, being the first complete generic key published for the family. Within a few years after 1920 the old genus *Mesembryanthemum* was split up into more than 150 genera (of which over 40 were monotypic)—yet a key defining their differences was not constructed until recently, and then under unusual circumstances: Due to their German birth both Herre and Volk were interned in a South African prison-camp during the last war, and here they profitably spent time in constructing this key from available literature, obtained through the help of "friends on both sides of the barbed wire." Not the skimpy key we are used to, it includes full generic descriptions.

The concluding section by Jacobsen lists the 2399 species now considered valid—excepting those in the recent continuation of Dr. Bolus' "Notes" which appeared too late for inclusion—as well as some 1800 synonyms, the latter always referring one to the latest name. The authors are listed, but places of original description are not; such data must therefore be sought in the often inaccessible "Index Kewensis" or, if one can afford it, in the out-of-print and clostly "Verzeichnis" of Jacobsen. It's interesting to note that the "pre-Nel" concept of *Lithops* is followed, 78 species and varieties being listed, although the 50 species in Nel's classification are also given; on the same page appears an interesting new combination (one of a number here proposed by Schwantes) concerning a former *Lithops* that has proved somewhat of a botanical misfit, having characteristics of both genera. Its name is now *Dinteranthus vanzylii* (L. Bol.) Schwant.

Quite a few misprints and omissions mar the species list, several unimportant genera are omitted from the key, while the remainder are difficult to find there without the help of an index. These faults are not too important considering the very high quality of the work. As the most compact and useful handbook on the Mesembs it most certainly deserves a wider audience; an edition in English would therefore be a desirable project.

MYRON KIMNACH.

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